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DEPARTMENT OF PUBLIC WORKS, CANADA

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INTERIM REPORT

GEORGIAN BAY SHIP CANAL

BRIEF DESCRIPTION AND DETAILED ESTIMATES OF COST FOR PROPOSED WATERWAY

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GEORGIAN BAY SHIP CANAL SURVEY,
DEPARTMENT OF PUBLIC WORKS OF CANADA.
[illegible]awa, July 2, 1908.

EUGENE D. LAFLEUR, Esq.,
Chief Engineer,
Public Works Department.

SIR,—Pending the completion of the Georgian Bay Ship Waterway Report, I have the honour to submit for your information a complete detailed estimate of cost of the proposed undertaking, accompanied by estimate plans illustrating the project in its main features.

The estimate is preceded by a brief description of the project and such explanations as are thought to be necessary for the present purpose.

The detailed cost is made up, first, for each reach or level, this including all structures governing the reach, and all excavations up to the foot of the next level. This is followed by various summaries of cost for the entire route.

As to the writing up of the different subjects related to the project, this is well advanced, but some of the questions being treated require further investigation; these, it is expected, will be concluded in a few weeks, excepting the question of storage or control of flood waters, which will have to form the subject of a supplementary report.

The plans which are being prepared to accompany the report are also well advanced. Quite a number of them are finished and have been lithographed; the balance w[illegible] in a short time.

The [illegible] working plans could now be exhibited in our offices at stipulated days [illegible] to be viewed by those taking an interest in the project, should this be de[illegible]sable, prior to the completion of the final report.

I have the honour to be, sir,
Your obedient servant,

A. ST. LAURENT,
Assistant Chief Engineer and Engineer-in-Charge.

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INTERIM REPORT

GEORGIAN BAY SHIP CANAL

BRIEF DESCRIPTION AND DETAILED ESTIMATES OF COST FOR PROPOSED WATERWAY

The estimates presented herewith are based upon a project for a waterway at least 22 feet in depth. It has been worked out in all its main details, which are shown on the plans prepared in this connection, and which will be explained very fully in the final Report.

PROJECT.

The style of navigation proposed is known as the 'dam and lock system,' with slack water reaches between structures. The whole is designd on such lines as to enable boats of large lake size (600 ft. x 60 ft. x 20 ft. draft) to pass from Lake Huron, through pond after pond to Montreal, the head of ocean navigation on the St. Lawrence river.

The project is essentially a river and lake canalization scheme, taking advantage of natural channels which fortunately can be made to form 80 % of the distance from Georgian Bay to Montreal.

ROUTE.

Of the 440 miles of projected navigation between the above mentioned points, from 410 to 420 miles follow the course of some river or lake.

For that part of the route from Georgian Bay to the height of land separating the watersheds of the Ottawa river and the Great Lakes, a distance of 81 miles, the French and Pickerel rivers and Lake Nipissing are utilized. From Lake Nipissing, through the height of land, for a distance of 3½ miles, the route is an artificial waterway, with the exception of a few small lakes through which it is located.

This artificial cut leads into Trout lake, thence into Turtle lake, the Little Mattawan river and Talon lake, which is utilized as far as Sand bay at its eastern end, a distance altogether of 21 miles. Trout and Talon lakes referred to above are very deep and fairly large bodies of water.

From Sand Bay there is a canal for three miles to the Mattawa river, which river is utilized as far as the town of Mattawa, a distance of 13 miles, where another canal cut ¾ miles in length makes an entrance into the Ottawa river.

This river, which expands into large and deep lakes in many places, is followed all the way down to the foot of Lake of Two Mountains (Oka lake), a distance of 293 miles.

From the foot of Lake of Two Mountains to Montreal, a distance of 25 miles, either the St. Lawrence river or a branch of the Ottawa river called Rivière des Prairies, flowing north of the Island of Montreal, may be utilized. The former route has 5 miles of artificial waterway and the latter about 11 miles.

By the first route, the canal enters Montreal harbour at its upper end. By the second route the St. Lawrence ship channel is joined at Bout de l'Ile, some 11 miles below the eastern boundary of Montreal harbour, or 17 miles below the City Custom house.

DISTANCES.

Taking Port Arthur or Fort William as a starting point, the distance to Montreal via the proposed waterway, is 934 miles; via Lake Erie and the Welland canal, 1,216 miles; via Buffalo and Erie canal to New York, 1,358 miles; giving a difference in favour of the projected route of 282 miles as compared with the present St. Lawrence route, and of 424 miles as compared with the Buffalo-New York route.

Comparing the distance from Fort William to Liverpool via Montreal and via New York, we have:—

	Miles.
Fort William to Liverpool via Georgian Bay canal......	4,123
" " New York.........	4,929

giving a difference of 806 miles in favour of the Georgian Bay Ship Canal—Montreal route.

Other comparative distances can be found on the Transportation map prepared in connection with the Report. This map is now available.

TIME OF TRANSIT.

This is affected by the length of restricted channels on the route, where speed has to be reduced, and by the number of lockages and consequent delays. A close computation of the speed allowable in the different stretches, with about three-quarters of an hour delay for passage at each lock, gives about 70 hours, as time of transit from Georgian Bay to Montreal.

With the advantage of shorter distance between terminal harbours, it is computed that the route will be from 1 to 1½ days faster than any other existing water route, under present conditions, from the head of the Great Lakes to an ocean port, apart from also having an enormous superiority as to carrying capacity. But as compared with a possible improved system of St. Lawrence canals to a depth of 22 feet, assuming that the number of locks would be greatly reduced and some of the channels widened, probably no practical benefit in time of transit could be claimed, the saving in distance being nearly offset by the longer stretches of lake and wide river navigation which exist through the Lake Erie and Lake Ontario route, where higher speeds would be permissable.

CHANNELS.

The total length of what may be termed canal cutting for the entire route is about 28 miles, by the project connecting with the St. Lawrence river above Montreal, through Lake St. Louis; and 34 miles, should the Rivière des Prairies route be selected.

The length of submerged channels to be excavated is about 66 miles, in stretches of varying lengths. Apart from this there is an aggregate of 14½ miles of route where obstructions such as shoals, sharp bends, &c., have only to be removed to form very wide channels.

Therefore, of the 440 miles constituting the waterway, 108 miles will require excavation work, for locks, approaches, canals, submerged channels, &c., leaving 332 miles of natural river or lake channels, which will not require any improvement beyond the raising of the water surface as recommended in connection with the project.

Taking into account the 14½ miles of obstructions, which after removal will leave wide free channels, the route may be subdivided as follows, in relation to width :

	Miles.
Canal cuts, 200 to 300 feet wide, including necessary restrictions at locks	28
Improved channels, submerged sides, 300 feet wide	66
Free channels, 300 to 1,000 feet wide and over	346
Total	440

The relative length of canals and submerged channels may be varied slightly, as it is an open question as to the exact point where the one ends and the other begins.

The sides of all submerged cuts will be shown by piers or clusters of piles at suitable distances, to indicate the channel and to aid vessels in navigating. Along curves these piers will be provided with lights, and each different course will be defined by ranges.

The restricted channels are widened at all bends, and conditions for navigation in these restricted parts will be as good, it is expected, as on the St. Mary's river, or the St. Clair and Detroit river channels.

The depth of 22 feet selected for the waterway will more than equal the conditions as they exist to-day in the channels connecting the waters of the Great Lakes, the St. Mary's river, Hay lake, St. Clair Flats canal, and Detroit river.

The improvement carried out for these lake channels, since 1892, contemplated a depth of 20 feet below the mean water surfaces as determined up to that time. Since then, however, the prevailing water levels of Lakes Huron, St. Clair and Erie have been almost continuously below the mean stage as formerly determined, and in consequence the actual draft available on account of lake fluctuations has been only 17 to 19 feet. (Report of Chief of Engineers, U.S.A., Vol. V., 1907.)

It has therefore been found necessary to increase this depth, and some of these channels are now being deepened to 21 and 22 feet in order to obtain a safe 20-foot draft at all times.

The Georgian Bay Ship Waterway, therefore, with a minimum depth of 22 feet, will compare favourably with any of the channels above mentioned, which govern the draft of boats on the Great Lakes.

The mileage of excavation in canals and channels for the route may be subdivided as follows, for each class of material encountered:—

DRY EXCAVATION.

Rock, about	25 miles.	
Earth, about	13 "	
Mixed earth and rock, about	20 "	
		58 miles.

WET EXCAVATION.

Rock	18 miles.	
Earth	16 "	
Mixed earth and rock	16 "	
		50 miles.
Total		108 miles.

This mileage includes all points which are to be dredged or excavated, whethe canal cuts, submerged channels or shoals. A small percentage of the excavation give as submarine rock work, might possibly be done in the dry, and the cost therefor reduced. In the estimates, when doubt existed, the rock excavation has been invariably classified as wet rock.

TERMINAL HARBOURS.

As the harbour of Montreal forms the eastern terminus of the waterway, no special provision is made in the estimate for increased terminal facilities. By the time th waterway is completed, with the works now under construction and the extensive improvements proposed, the harbour will no doubt afford sufficient dockage faciliti to meet the requirements of the increase in traffic contributed by the new route. A this traffic develops, facilities will be extended naturally as part of the harbour works.

The western entrance to the waterway on the Georgian Bay is formed by French River harbour. As this will be only a transit point to and from terminal harbours already established, no terminal facilities are required other than improvements in certain parts of the entrance, and increased aids to navigaation. These improvements are included in the estimate.

SUMMIT.

The summit level embraces Lake Talon, the Little Mattawan river, Turtle and Trout lakes, their present surfaces being raised to elevation 677. Talon lake will be raised 41 feet, and Trout and Turtle about 15 feet above their present level. The locks at both ends of the Summit are designed to allow of the large lake thus created being lowered to elevation 671 without interfering with navigation. In fact, besides affording a wide and unobstructed route for shipping in transit, the lake will have two important duties; to absorb in part the excess in floods, and to store the reserves for the months of deficient water supply.

From the careful hydraulic investigations made, the available supply from the summit watershed, with the storage provided, will be 540 cubic feet per second throughout the season of navigation, which will allow of an average of 24 passages per day or 5,040 passages for the season.

As the traffic develops, in the event of this supply being insufficient to meet the demand upon the Summit, the supply can be augmented by 700 cubic feet per second by creating storage reserves at the head of the Amable du Fond river, and diverting it from its present outlet into the summit lake. This can be accomplished at an expenditure of $900,000.

These two sources of supply will more than meet the requirements at the Summit, should the waterway ever be worked to its full commercial capacity.

LENGTH OF NAVIGATION SEASON.

From the investigations made the opening and closing of navigation for the waterway would coincide closely to the opening and closing of ocean navigation for the harbour of Montreal, the length of the season being perhaps a few days shorter.

This would be governed by Lake Nipissing and conditions at the Summit and the Mattawa reaches, and the indications are that an average of 210 days would be available.

LOCKS.

The difference in elevation of 659 feet between Montreal and the summit level, and of 99 feet between the Summit and Georgian Bay is overcome by 27 locks ranging in lift from 5 to 50 feet. By the Rivière des Prairies route, however, this number is reduced to 26.

All locks are designed to be built of concrete.

Regarding their size, lake boats have attained a length of over 600 feet, and the minimum dimensions of lock chambers should not be less than 650 feet in length, by 65 feet in width. The estimated cost of the locks is based on these dimensions, but in the final report the additional cost of building them 800 feet in length by 75 feet in width, should it be found desirable, will be given. In all cases the depth of water on the sills will be 22 feet at extreme low stage.

DAMS.

The navigation scheme requires the building of 45 dams of various sizes, not including those which will be required in connection with a system of storage reservoirs.

Generally, where the quantity of water is much above the canal requirements, the rock fill type of dam has been adopted. Where, however, it is important to economize water for lockages concrete dams have been designed. The estimate of cost is based on these types of dams, and the stop-log system of regulation sluices has been adopted throughout, with the exception of a few locations where Stoney sluices are deemed necessary.

STORAGE.

Intimately connected with the navigation scheme is the question of control of the flood waters of the Ottawa river. This would be of great benefit to navigation as well as to industries along the river depending on water power. It is intended to effect this by creating large storage reservoirs, so regulaated that during flood season they will retain a portion of the surplus waters, which will be gradually released during low water periods. This question will be discussed in the report, but cannot be closed, as a complete solution of the problem will require more extended investigations than it has been possible to make so far.

WATER POWERS.

The present plans for the construction of the canal entirely alter the general features of the river. For the purpose of lockage, the falls are concentrated, and all of the small rapids obliterated. The dams built for navigation purposes, by concentrating the fall at one point, eliminate the greatest difficulty in the development of the water powers. In addition, the needs of navigation require the elimination of extreme high water by the construction of a system of storage reservoirs at the upper reaches of the Ottawa river and its main tributaries, the water stored to be released at low water period, thus increasing the average low flow for power purposes.

The data collected up to date shows that nearly 1,000,000 horse power can be secured along the Ottawa and French rivers by the improved method of development. It is doubtful if more than 150,000 horse power at minimum flow could be developed under present conditions.

This question of water powers is still being investigated, as some more data has to be collected.

It may be mentioned, however, that the Chaudiére powers are not interfered with by the project. In the case of undeveloped water powers which are destroyed, and which have been leased or sold by the Ontario or Quebec governments, a certain sum has been placed in the estimate to cover possible claims. No doubt, in many cases, it will be possible to compensate the claimants by giving them power privileges at some of the dams built in connection with the project.

The final report will give all the information available regarding this question.

DAMAGES.

On several of the reaches considerable land will be flooded permanently. Most of this land is now every year inundated from four to six weeks. The area so flooded has been computed for each reach, and the amount to be paid, included in the estimate at a fair value per acre. In the case of damage to buildings, the cost of their removal to higher ground or purchase has been considered and provided for.

CONSTRUCTION.

A careful analysis of the work to be performed shows that it would take from three to five years to develop all contracts and place the whole route under active construction. Some of the sections where heavy submarine excavation is encountered would require at least five years to complete, under the best conditions of labour and equipment. It may be fairly stated, therefore, that a period of ten years from inception, would be necessary to open the waterway to navigation. This would mean an average expenditure of about $10,000,000 per year.

UNIT PRICES.

For the various items that appear in the estimate of cost, the prices were adopted after careful consideration, and they conform generally to the prices paid by the Department for similar work. These prices have been altered, where necessary, to meet special conditions of location and character of the work to be performed.

Respectfully submitted,

A. ST. LAURENT,
Asst. Chief Engineer and Engineer-in-Charge.

C. R. COUTLEE,
District Engineer.

S. J. CHAPLEAU,
District Engineer.

Approved,

EUGENE D. LAFLEUR,
Chief Engineer.

SUMMARY OF ESTIMATED COST FOR A NAVIGABLE WATERWAY 22 FEET DEEP FROM MONTREAL TO GEORGIAN BAY VIA THE OTTAWA, MATTAWA AND FRENCH RIVERS

ROUTE A.

Via Montreal, Lake St. Louis, Ste. Anne de Bellevue, Ottawa, Rocher Fendu channel, Coulonge, Pembroke, DesJoachims, Mattawa, Talon lake, North Bay, Lake Nipissing and French river.

Locks, dams, channels, piers, lighting, damages.	$88,626,108
Contingencies, engineering, administration, say 10%. .	8,862,892
Storage of flood waters, regulation basins, telephones, &c	2,200,000
Total	$99,689,000
Feeder at Summit, when required	900,000

ROUTE B.

Same as route A, excepting that Rivière des Prairies, north of Montreal Island, is followed instead of Lake St. Louis and St. Lawrence river above Montreal.

Locks, dams, channels, piers, lighting, damages.	$83,354,508
Contingencies, engineering, administration, say 10%. .	8,335,492
Storage of flood waters, regulation basins, telephones, &c.	2,200,000
Total	$93,890,000
Feeder at Summit, when required	900,000

NOTE.—Land damages are partly covered by estimation and partly by contingencies. In most cases of undeveloped water powers, it has been assumed that owners could be compensated by being granted power privileges at nearest dam. Cost of damages, at best, cannot be well defined. In ten years from now, it is likely that damages to pay would be much larger, as conditions on the river would be much more involved. This amount cannot be well foreseen. It might be larger than estimated by one or two millions according to conditions at the time of construction and legal view taken of some of the claims.—A. ST. L.

ESTIMATE MONTREAL REACH.

Custom House to Verdun, mile 0 to 5; Surface elevation, 52; Surface of harbour below, elevation 20; Lift, 32 ft.

Montreal lock:—		
Excavation, rock	$ 75,500	
Unwatering pit	10,000	
Concrete, lock walls, &c.	450,700	
Entrance piers	409,500	
Lock gates	109,200	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$1,090,700
Dam and regulation:—		
Embankments, rock and earth	$ 53,000	
Regulating culverts	11,000	
		$64,000
Channel:—		
Excavation, rock, wet	$531,000	
Excavation, rock, dry	81,600	
Embankments, rock and earth	636,300	
Bank protection	97,400	
Light and marks	6,000	
		$1,352,300
Damages:—		
Land and rights	$ 47,200	
Water supplies	535,000	
Drainage	250,000	
Bridging	519,800	
		$1,352,000
		$3,859,000

The geology of the lower 200 miles of the Ottawa creates seven main steps, at each one of which one or more locks are required.

The first series of locks and channels are to connect Oka lake and Montreal harbour. Between these surfaces the rise is 55 feet, chiefly due to the plunge made by the St. Lawrence at Lachine rapids.

The Montreal lock is opposite the custom house near the Mackay pier. The Verdun lock, 5 miles further up, gains the surface of Lake St. Louis through which the line ascends to Ste. Anne. The Ste. Anne lock makes the rise to Oka lake and the channel leads up to Pointe Fortune.

The western part of Montreal, above Victoria bridge, is protected from high water by the Verdun dyke. This suggests keeping high water surface permanently by embankments from Point St. Charles to Nun's island, and thence up to join the shore at Verdun hospital.

The impounded basin would be 22 feet in depth and afford an upper harbour five miles in length.

The time required to complete this reach depends upon the rate of excavation in Verdun canal cutting ,that is, five years because the embankments are made up of the material excavated.

Time to navigate, 1½ hours.

ESTIMATES OF LAKE ST. LOUIS REACH.

Verdun to Ste. Anne, mile 5 to 24; Surface elevation, 70; Surface below, elevation 52; Lift, 18 ft.

Verdun lock:—		
Excavation, rock and earth..	$138,200	
Unwatering pit	10,000	
Concrete, lock walls, &c.	405,000	
Entrance piers	414,500	
Lock gates	89,500	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$1,093,000
Dam and regulation:—		
Regulating culverts	12,200	
		12,200
Channel:—		
Excavation, rock, wet	$6,609,800	
Excavation, rock, dry	2,305,900	
Excavation, earth, wet	593,300	
Excavation, earth, dry	763,400	
Embankments, rock and earth	544,600	
Guide piers	124,600	
Bank protection	84,200	
Lights and marks..	45,000	
		11,070,800
Damages:—		
Land and rights..	240,000	
Water supply..	7,000	
Bridging..	130,000	
		377,000
		$12,553,000

Above Verdun lock is full depth cutting for three miles across the point to Lachine bank, then an embanked canal along shore for two miles up to Lachine. Through the north portion of Lake St. Louis the channel proceeds to St. Anne.

The canal cut is 22 feet deep, 200 feet wide at bottom and 290 feet at top, with side slopes 2 out to 1 up.

The canal excavation consists of three million cubic yards of earth and two millions of rock, all of which will be used to form the embankments for Montreal basin below and the canal side banks above to Lachine.

In Lake St. Louis there are two million yards of rock and two millions of earth to be excavated. The north side of the lake is shallow and the surface fluctuates so that it is not only necessary to dredge the shoals, but to dredge deep enough for 22 feet at the lowest stage.

The time probably necessary to complete this reach would be five years owing to the heavy excavation.

Time to navigate, 3.1 hours.

ESTIMATE OKA LAKE REACH.

Ste. Anne to Pointe Fortune, mile, 24 to 49; Surface elevation, 75; Surface below, 70; Lift, 5 feet.

Ste. Anne lock :—		
Excavation, rock	$ 41,800	
Unwatering	10,000	
Concrete, lock walls, &c.	268,300	
Entrance piers	356,000	
Lock gates	72,900	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$ 784,800
Dam and regulation :—		
Embankments, rock and earth	$ 51,700	
Regulating sluices	309,100	
		$ 360,800
Channel :—		
Excavation, rock, wet	$ 576,300	
" earth, wet	335,200	
Lights and marks	25,800	
		$ 937,300
Damages :—		
Land and rights	$ 188,500	
Bridging	62,600	
		$ 251,100
		$ 2,334,000

For a mile above Ste. Anne lock there is a rock dredging to form the channel and then earth dredging to Cadieux island. The line then follows a deep portion of the lake to Hay island, where a million cubic yards of soft dredging is necessary. From this up, the width narrows to ½ mile, which continues 8 miles to Pointe Fortune.

The lock at Ste. Anne is crossed by the Canadian Pacific and Grand Trunk railways, both double track on bascule drawspans.

The excavation above Ste. Anne will employ two dredging plants for five seasons, which would correspond to the time required for the work through Lake St. Louis.

Time to navigate, 2.8 hours.

ESTIMATE POINTE FORTUNE REACH.

Pointe Fortune to Hawkesbury, mile 49 to 59; Surface elevation, 115; Surface below, 75; Lift, 40 feet.

Pointe Fortune lock :—		
Excavation, rock and earth	$218,700	
Unwatering pit	10,000	
Concrete, lock-walls, &c.	634,400	
Entrance piers	458,700	
Lock gates	119,800	
Valves, motors, and lights	25,800	
Bollards, life chains, &c.	10,000	
		$1,477,400
Dams and regulation :—		
Embankments, rock and earth	$219,400	
Regulating sluices	142,500	
		$ 361,900
Channel :—		
Excavation, rock, wet	$1,026,200	
" " dry	356,900	
" earth, dry	407,800	
Bank protection	47,800	
Lights and marks	43,000	
		$1,880,900
Damages :—		
Land and rights	$ 128,600	
Bridging	12,000	
		140,600
		$3,860,800

The locks at Pointe Fortune and Hawkesbury furnish the means of rising over the Vaudreuil ridge from Oka lake to the long reach below Ottawa, a vertical distance of 60 feet.

Above the lock is a canal 2 miles long and 200 feet wide, issuing into a raised level of the river that extends to Hawkesbury. The level is maintained by the first of the series of large rock embankment dams, this one containing nearly half a million cubic yards of material.

From Cushing to Greece Point (mile 53 to 56), the river flows through a rock canyon, but the rise of the surface below Hawkesbury lock.

Excavation begins about a mile below Hawkesbury lock.

The time for construction depends upon the rate of canal excavation at Pointe Fortune, which could be accomplished by five excavating plants in four years.

Time to navigate, 1¼ hours.

ESTIMATE OTTAWA REACH.

Hawkesbury to Hull, Mile 59 to 120; Surface elevation, 140; Surface below, 115; Lift, 25 feet.

Hawkesbury lock:—		
Excavation, rock and earth	$119,100	
Unwatering pit	10,000	
Concrete, lock walls &c	466,500	
Entrance piers	257,700	
Lock gates	100,500	
Valves, motors and lights	25,800	
Bollards, life chains, &c	10,000	
		$ 989,600
Dams and regulations :—		
Embankments, rock and earth	$ 10,600	
Regulating sluices	197,200	
		207,800
Channel :—		
Excavation, rock, wet	$2,110,700	
" " dry	703,700	
" earth, wet	280,000	
" " dry	58,700	
Embankments, rock and earth	203,000	
Guide piers	291,000	
Lights and marks	103,800	
		$3,750,900
Damages :—		
Land and rights	$1,062,300	
Water supplies	5,000	
Drainage	5,000	
Bridging	149,200	
		$1,221,500
		$6,169,800

From the lock to the town of Hawkesbury is a two mile canal 200 feet wide through which the surface of the river is produced. North of this canal the rapids will exist as usual from the Grenville sluiceways down to the lock.

For two miles above Hawkesburry 1½ million cubic yards of rock and earth are to be excavated, but beyond this there are only four places which require dredging up to Ottawa, viz.: below Thurso (mile 93), Blanche river (mile 110), Templeton (mile 114), Kettle island (mile 118). No rock work will be necessary.

The surface at which this reach is to be held will flood 18,000 acres of land, principally the shore flats from Montebello to Gatineau Point.

The time for construction depends upon the Hawkesbury excavation, which could be completed in three years.

The reach could be navigated in 6¾ hours.

ESTIMATE HULL REACH.

Hull Lock No. 1 to Hull Lock No. 2, Mile 180 to 181; Surface elevation, 168; Surface below, 140; Lift, 28 feet.

Hull Lock No. 1 :—		
Excavation, rock and earth	$320,600	
Unwatering pit	10,000	
Concrete, lock walls, &c.	410,600	
Entrance piers	53,600	
Lock gates	99,100	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$929,700
Dam and regulation :—		
Regulating sluices	$ 5,700	5,700
Channel :—		
Excavation, rock, dry	365,900	
" earth, dry	94,500	
Guide piers	270,000	
		730,400
Damages :—		
Land and rights	$500,400	
Drainage	17,600	
Bridging	140,000	
		658,000
		$2,323,800

The two locks at Hull are to overcome the Hull-Gloucester fault, over which disturbance the plunges at Deschenes, Remicks and Chaudière falls take place.

A location in the valley of Brewery creek has been chosen ,and lock 1 so placed as to suit the necessary railway crossings.

Above the lock is a ¾-mile reach led across Brewery creek between concrete side walls. The creek itself is passed beneath the canal by a pipe culvert, so that the tail-race of the Hull city water works is not altered.

Time to navigate, 1 hour.

ESTIMATE AYLMER REACH.

Hull to Chats Rapids, Mile 121 to 154. Surface elevation, 195; Surface below, 168; Lift, 27 feet.

Hull lock No. 2 :—		
Excavation, rock	$143,500	
Unwatering pit	10,000	
Concrete, lock walls, &c.	281,200	
Entrance piers	105,700	
Lock gates	97,500	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$673,700
Dam and regulation :—		
Embankments, rock and earth	$312,600	
Regulating sluices	94,000	
		406,600
Channel :—		
Excavation, rock, wet	$2,201,500	
" rock, dry	587,900	
" earth, wet	102,500	
Lights and marks	46,900	
		2,938,800
Damages :—		
Land and rights	$493,000	
Water-powers	875,000	
Water supplies	25,000	
Railway charges	170,000	
Bridging	17,000	
		1,580,000
		$5,599,100

Lock No. 2 was placed so that Brewery street and its electric car line could be crossed at the lower end. The Aylmer electric line will be diverted to this bridge, and also the highway traffic of the Aylmer road.

Above lock No. 2 is one mile of canal which issues into the raised level of the river, maintained by a large rock embankment dam with sluiceways above Chaudière falls. The rock excavation from the canal furnishes more than sufficient material for the dam.

At Deschenes rapids heavy rock excavation is necessary, not only for the boat channel, but to enlarge the river and prevent current. There is ample depth and width up Aylmer lake for 20 miles to Crown point, where soft material is to be dredged. Thence for four miles, to Chats lock, is free channel.

The construction would take three to four years, depending on the rate of work at Hull.

The reach could be navigated in 3½ hours.

ESTIMATE ARNPRIOR REACH.

Chats Rapids to Chenaux Rapids, Mile 154½ to 174. Surface elevation, 245; Surface below, 195; Lift, 50 feet.

Chats lock:—		
Excavation, rock..	$221,900	
Unwatering pit..	10,000	
Concrete, lock walls, &c..	291,400	
Entrance piers..	119,500	
Lock gates..	139,600	
Valves, motors, lights, &c...	25,800	
Bollards, life chains, &c...	10,000	
		$ 818,200
Dam and regulation:—		
Embankments, rock and earth..	$399,600	
Regulating sluices..	78,100	
		477,700
Channel:—		
Excavation, rock, wet..	$768,800	
" rock, dry..	562,900	
" earth, wet..	8,700	
Embankments, rock..	19,700	
Lights and marks..	61,300	
		1,421,400
Damages:—		
Land and rights..	$28,300	28,300
		$2,745,600

The Chats lock makes the rise of 50 feet from Aylmer lake, over a spur of the Laurentian that extends across the river southwards to Galetta.

Above the lock is 1½ miles of canal cut in granite, and at its head a rock embankment dam crosses to the Ontario shore. The dam is provided with sluiceways, and will keep Arnprior lake up to ordinary high water level.

Above the canal there is a mile of rock dredging through shoals and islands, but beyond this for 17 miles (157 to 174) there is little to be done.

The dry rock excavation in Chats canal will take three years, and the submarine work could be completed in the same time.

Time to navigate, 2¾ hours.

ESTIMATE PORTAGE DU FORT REACH.

Chenaux Rapids to Rocher Fendu, Mile 174 to 187. Surface elevation, 280; Surface below, 245; Lift, 35 feet.

Chenaux lock :—		
Excavation rock..	$174,100	
Unwatering pit..	10,000	
Concrete, lock walls, &c..	284,300	
Entrance piers..	304,400	
Lock gates..	110,800	
Valves, motors, lights, &c..	25,800	
Bollards, life chains, &c..	10,000	
		$919,400
Dams and regulation :—		
Embankments, rock and earth..	$471,000	
Regulating sluices..	125,200	
		596,200
Channel :—		
Excavation, rock, dry..	$336,300	
Lights and marks..	47,600	
		383,900
Damages :—		
Land and rights..	$62,800	
Bridging..	70,000	
		132,800
		$2,032,300

Chenaux lock is the first of the series of three that make the rise of 100 feet between Arnprior lake and Coulonge lake, over the granite isthmus that extends diagonally across Ontario, forming the Thousand Islands and ending in the Adirondacks.

The lock is located on a rock island, and from it extends the rock embankment that dams up Portage du Fort level for 13 miles to Rocher Fendu lock No. 1. The raised surface greatly reduces the rock work above Portage du Fort, while the damage to the village is not excessive.

By excavating during the low water periods the various islands and shoals can be taken out dry instead of dredging at three times the cost.

The construction of the lock and dam will require three seasons, during which the remainder of the work would be completed.

Another channel by Calumet falls and Bryson village to Coulonge has been projected to branch off above Portage du Fort at mile 183.

Time to navigate, 2 hours.

ESTIMATE ROCHER FENDU REACH.

Rocher Fendu Lock No. 1 to No. 2, Mile 187 to 190. Surface elevation, 315; Surface below, 260; Lift, 55 feet.

Rocher Fendu lock No. 1 :—		
Excavation, rock	$ 81,300	
Unwatering pit	10,000	
Concrete, lock walls, &c.	505,000	
Entrance piers	328,900	
Lock gates	110,800	
Valves, motors, lights, &c.	25,800	
Bollards, life chains, &c.	10,000	
		$1,071,800
Dams and regulation :—		
Embankments, rock and earth	294,700	
Regulating sluices	57,700	
		352,400
Channel :—		
Excavation, rock, wet	38,900	
Lights and marks	10,500	
		49,400
Damages :—		
Land and rights	8,200	8,200
		$1,481,800

This is the middle lock and reach of the series between Arnprior and Coulonge lakes.

The Rocher Fendu or 'Split Rock' is a canyon river from the lake up eight miles to Sullivan island (mile 186 to 194). A projecting point from the steep rock side, at mile 187½, gives just enough space for lock No. 1. The dam is a rock embankment, crossing diagonally from the head of lock.

All the rapids in the three miles up to lock No. 2 are completely drowned out by the 50 foot rise of surface.

About two seasons would be required for construction.

Time to navigate, 1·15 hours.

ESTIMATE COULONGE LAKE REACH.

Rocher Fendu Lock No. 2 to Paquette Rapids, Mile 190 to 209. Surface elevation, 350; Surface below 315; lift, 35 feet.

Rocher Fendu lock No. 2 :—		
Excavation, rock	$137,900	
Unwatering pit	10,000	
Concrete, lock walls, &c.	313,000	
Entrance piers	444,700	
Lock gates	110,800	
Valves, motors, lights, &c.	25,800	
Bollards, life chains, &c.	10,000	
		$1,052,300
Dams and regulation :—		
Rock and earth	448,000	
Regulating sluices	140,500	
		588,500
Channel :—		
Excavation, rock, wet	819,900	
" rock, dry	792,500	
" earth, wet	642,400	
Lights and marks	40,100	
		2,294,900
Damages :—		
Land and rights	4,700	4,700
		$3,940,400

Lock No. 2 makes the final lift up to Coulonge level, which would be produced down three miles and retained by a dam, near the head of the lock.

The excavation on the lower seven miles of this reach is very heavy, amounting to a million cubic yards of rock and a million cubic yards of earth up to La Passe. Opposite Coulonge village (mile 199½ to 202½) there is heavy excavation in gravel and boulders, and three miles further on, at Finlay island, will be clear sand dredging for two miles.

The construction period will depend on the rate of excavating in the lower seven miles, and three years might be considered sufficient.

Time to navigate, 2¾ hours.

ESTIMATE PEMBROKE REACH.

Paquette Rapids to DesJoachims, Mile 209 to 265. Surface elevation, 370; Surface below, 350; Lift, 20 feet.

Paquette lock :—		
Excavation, rock and earth..	$344,100	
Unwatering pit..	10,000	
Concrete, lock walls, &c..	311,500	
Entrance piers...	242,000	
Lock gates..	87,400	
Valves, motors, lights, &c..	25,800	
Bollards, life chains, &c..	10,000	
		$1,030,800
Dam and regulation :—		
Embankments, rock and earth..	$143,000	
Regulating sluices..	66,600	
		209,600
Channel :—		
Excavation, rock, wet..	$2,651,300	
" rock, dry..	127,200	
" earth, wet..	46,700	
" earth, dry..	73,400	
Lights and marks..	85,900	
		2,984,500
Damages :—		
Land and rights..	175,300	175,300
		$4,400,200

The project is to raise [illegible] llumette lake to the same level as Deep river, making one long reach (56 miles) to DesJoachims.

The dam extends from the lock to Allumette Island, and will contain over a quarter million cubic yards of loose rock.

Above the lock the excavation amounts to half a million cubic yards of rock, which can be taken out dry. At Morrison's island, the rapid being destroyed by the raising of the lower lake, is necessary to deepen the river in order to secure a moderate speed of flow. This entails the excavation of 1½ million cubic yards of rock, most of which can be dammed off and done dry.

At the lower narrows (mile 231 to 236) there are scattered rock shoals to be removed, but beyond this for 30 miles through Deep river to DesJoachims, no work is required.

Owing to the heavy excavation at Morrison's island and Paquette, four years may be placed as the time required for construction.

Time to navigate, 6½ hours.

DesJOACHIMS REACH.

Above the DesJoachims lock, mileage 266, there is a reach 17½ miles long to the foot of the Rocher Capitaine rapid, at mileage 283½. By raising the water surface in this reach to elevation 410, or about 20 feet above the present elevation, all the rapids therein will be obliterated; some small excavation about midway being required. This pool is situated between high ranges of hills, so that raising the water to the above elevation will do no material damage. Some rip-rap will be required on the Canadian Pacific Railway embankment at Mackey creek crossing, and the Pembroke road will require to be diverted.

At mileage 275, the Du Moine river empties into the Ottawa, carrying considerable flood water in the late spring. The river over this reach is wide and deep, and any changes, of course, for vessels navigating it will be easy and of slight curvature.

ESTIMATE OF COST OF DesJOACHIMS REACH.

From DesJoachims to Rocher Capitaine—Mileage 265:4 to 283:6.

DesJoachims lock, (single lock 40-foot lift).			
Lock pit, rock, dry		$228,220	
Concrete, lock walls, &c		516,668	
Unwatering		10,000	
Equipment :—			
Electric light	$ 2,500		
Motors and battery	7,500		
Valves	15,840		
Machinery (for gates), eight machines	4,000		
		29,840	
Lock gates		115,800	
Approaches :—			
Cribwork (entrance pier)		431,932	
Mooring posts and ladders		10,000	
Loose rock beneath and rear of crib		76,663	
			$1,419,123
Dams and regulation :—			
Embankments, loose rock (south of lock, Ferris Bay and regulation)		22,628	
Embankment, earth		6,015	
Sluices (17 stop-log)		57,852	
Operating machinery (two at $700)		1,400	
			87,895
Channel :—			
Excavation—Canal prism, rock, dry		166,586	
" " rock, wet		957,820	
Lighting :-			
Lights and marks (DesJoachims to Ferris Point)		19,000	

Lighthouses (from Ferris Point to Rocher Captaine)	9,871	
Guide cribs (from Ferris Point, &c.)	33,034	
Guide cribs with lights (from Ferris Point, &c.)	12,054	
		1,198,365
Damages :—		
Flooded property	10,200	
Highway bridge at lock. Bascule, 75 feet	10,000	
		20,200
		$2,725,583

ROCHER CAPITAINE REACH.

The Rocher Capitaine rapid, 2½ miles long, at the head of this reach has a fall of 48 feet and is very tortuous. To overcome this rapid and obtain the best results above it, the river will be raised to elevation 470 or 30 feet above its present surface, by dams at the head of the rapid. A canal cut through the north end of the Rocher Capitaine island, having a flight of two locks, with a lift of 30 feet each at its lower end, will afford the connection between the two levels.

The locks will be of solid concrete throughout, operated by culverts through the side walls at the floor levels and controlled by cup valves. Double sets of steel gates at the upper, intermediate, and lower sills will afford the change of level. The locks will be built on rock foundation.

A hydro-electric plant situated near the lower end of the locks and supplied by water from the canal above, will furnish the power for operating the locks and valves, and for lighting the canal above and the approaches below.

Regulation of this reach above is obtained by 'Stoney sluices' 20 feet deep by 40 feet wide, placed in the dam at the head of the Rocher Capitaine rapid. On the north side of the regulation a heavy concrete dam, and on the south a rock and earth-fill dam across the main channel keep back the upper level. A rock-fill dam also blocks the sny back of the Rocher Capitaine island.

The reach above this canal to the foot of the Deux Rivières rapid is 10 miles long, very deep and wide, and suitable at the present time for the class of navigation desired. The river flows between high hills and is practically straight. No damage will be incurred from the raised water over this reach.

ESTIMATE OF COST OF ROCHER CAPITAINE REACH.

From Rocher Capitaine to Deux Rivières, Mileage 283·6 to 296·3.

Rocher Capitaine lock (flight of two locks, 30 feet lift each).			
Lock pit, rock, dry		$ 310,678	
Lock pit, earth, dry		15,809	
Concrete, lock walls, &c.		1,059,780	
Concrete, core walls, back fill		7,177	
Granite masonry		15,300	
Equipment :—			
Power plant	$ 7,500		
Electric power equipment	9,000		
Electric light equipment	2,500		
Bailing outfit	2,000		
Machinery and valves	25,000		
		46,000	
Lock gates		173,663	
Approaches and fill :—			
Cribwork		202,743	
Fill under cribwork, rock		1,011	
Back fill (behind lock walls and cribwork), rock		192,400	
Embankment :—			
Earth fill		2,682	
Rip-rap		1,185	
			$2,028,428

Dams and regulation:—		
Main channel:—		
Concrete dam and key wall	$113,355	
Concrete gate flooring	37,830	
Excavation, rock, dry	13,333	
Earth and rock fill	39,343	
Earth fill	2,626	
Timber mattress	33,588	
Eight 'Stoney gates'	173,651	
South Channel:—		
Earth and rock fill	47,648	
Earth fill	3,532	
Timber mattress	30,477	
		495,383
Channel:—		
Excavation:—		
Canal prism, rock, wet	$ 50,775	
“ earth, wet	1,928	
“ rock, dry	1,028,926	
“ earth, dry	305,757	
Lighting:—		
Lighthouses	3,750	
Guide cribs with lights	2,953	
		1,394,089
		$3,917,900

DEUX RIVIERES REACH.

From the head of the last reach, mileage 296, to the head of La Veillée rapid, mileage 299½, is the Deux Rivières rapid, with a total fall of 31½ feet.

The works to overcome Deux Rivières will consist of a dam at the foot of the rapid and a lock and canal on the south side. The canal will follow the depression of the Deux Rivières creek, and enter the river above the Trou rapid. This canal is about 1½ miles long, with an easy curve at its upper end.

The lock at the lower end of the canal will be of concrete on rock foundation, with a lift of 30 feet, operated by culverts under the floor, controlled by butterfly or roller-bearing valves, and double sets of steel gates at either end. The approaches to the lock at either end will be lined with cribwork. Across the river at the foot of the lock will be a rock-fill dam with 'Stoney sluices' between it and the lock, to regulate the pool above.

Power to operate the lock and light the approaches of the canal will be derived from a hydro-electric plant situated below the lock on the south side.

The reach above the Deux Rivières is wide and deep for eight miles, where some shallows occur in mid-channel at the Burrits' and the Rocky Farm rapids. From Mattawa, 20 miles above Deux Rivières, to La Veillée rapid the river has a fall of about 12 feet. By raising the river to elevation 500 this reach is made navigable with but small excavation at the rapids above named.

Raising the water surface will necessitate the relocation of the main line of the Canadian Pacific Railway between Deux Rivières and Klock, for a distance of about 6½ miles. Damage at Deux Rivières will be slight.

ESTIMATE OF COST OF DEUX RIVIERES REACH.

From Deux Rivières to Mattawa, Mileage 296·3 to 318·0.

Deux Rivières lock (single lock, 30 feet lift).			
Lock pit, rock, dry		105,938	
Lock, pit, earth, dry		1,275	
Concrete, lock walls, &c.		423,510	
Granite masonry		9,900	
Equipment—			
Power plant	$ 7,500		
Electric power equipment	5,000		
Electric light equipment	2,000		
Bailing outfit	2,000		
Machinery and valves	11,000		
		27,500	
Lock gates		103,612	
Approaches and fill :—			
Cribwork		241,902	
Rock fill under cribwork		7,387	
Back fill (behind lock walls and cribwork), rock		21,922	
Embankments :—			
Excavation, earth, dry		3,192	
Earth fill		8,601	
Clay puddle		4,800	
Rip-rap		5,519	
			965,058

Dams and regulation:—		
Main channel—		
Concrete dam and key wall	$ 31,470	
Concrete gate flooring	59,580	
Excavation, earth, dry	2,809	
Rock and earth fill	125,279	
Earth fill	8,355	
Timber mattress	50,121	
Five 'Stoney gates'	152,048	
Small dam—		
Concrete	22,365	
Excavation, earth, dry	420	
		452,447
Channel:—		
Excavation—		
Canal prism, rock, wet	$291,942	
" " dry	345,180	
" earth, wet	3,972	
" " dry	191,815	
Lighting:—		
Lighthouses	11,071	
Guide cribs	21,060	
Guide cribs with lights	5,476	
		870,516
Damages:—		
Flooded property at Deux Rivières	$ 10,000	
Relocating C.P.R. track	162,500	
Rip-rap along C.P.R.	900	
Damages to land and buildings at Klock	9,000	
		182,400
		$2,470,421

MATTAWA REACH.

At the town of Mattawa, mileage 319, the line leaves the Ottawa river and passes through the Mattawa river, continuing in it to its source and beyond through the divide into Lake Nipissing.

The line will pass behind the town at Mattawa, following a natural depression. The river above the town will be raised to elevation 510, or 10 feet above its present surface, by a concrete overflow crest dam across the river about a third of a mile from its mouth. A lock of 10 feet lift and canal above it will connect the two pools. The lock will be on solid foundations just inshore from the Ottawa river at the lower end of the town and similar in operation to that at the Deux Rivières. A bascule bridge at the head of the lock will give highway connection, and the Kippewa branch of the Canadian Pacific Railway will cross the canal above the lock on a single leaf bascule bridge.

Cribwork above and below line the approaches to the lock, the canal above the lock widening to 300 feet. The canal cut will average 35 feet in depth, the material being boulder drift. The reach above Mattawa is short, ending two miles above the lock, and is practically straight. Excavation occurs at scattered places to give a submerged canal 300 feet wide. The damage from raised water in this reach will be slight and will be confined to property along the river shore. Damage to obtain right of way through the town will be considerable.

ESTIMATE OF COST OF MATTAWA REACH.

From Mattawa to Plain Chant,—Mileage, 310·0 to 320·3.

Mattawa lock (single lock, 10 feet lift).		
Lock pit, rock, dry	$ 13,842	
" earth, dry	53,237	
Concrete	449,145	
Granite masonry	8,450	
Equipment and machinery	27,500	
Lock gates	78,947	
Approaches and fill :—		
Cribwork	235,158	
Fill under cribwork	243	
Fill behind lock wall and cribwork	7,835	
		$874,357
Mattawa dam and embankment weir :—		
Concrete, first class	$112,875	
Excavation, rock, dry	17,600	
" cemented material, dry	8,000	
" earth, dry	1,600	
Superstructure	26,600	
Unwatering	4,646	
		171,321
Channel :—		
Excavation :—		
Canal prism, earth, wet	$ 76,634	
" " dry	228,198	
Lighting :—		
Guide cribs (14)	16,255	
		321,087

Damages :—		
Damages about Mattawa town; land and buildings..	$77,810	
Bridges :—		
Canadian Pacific Railway, Mattawa (single rolling lift)..	50,950	
Pembroke high road at Mattawa (single rolling lift)..	10,000	
		138,760
		$1,505,525

PLAIN CHANT REACH.

At the head of the reach above Mattawa the side hills converge, confining the river to a narrow stream at the Champlain chute, the outlet of the Plain Chant lake above. A dam across this gorge and a lock, 30 feet lift, at mileage 322, will give access to the Plain Chant lake level, which will be raised to elevation 540, or about 23 feet above its present surface.

The Plain Chant lock will be situated on the north side of the river, and have cribwork approaches at either end. Between the approaches a small amount of excavation will be necessary. Spanning the river from the upper entrance wall of the lock, to the south shore, will be a solid concrete dam of the overflow type regulating the Plain Chant level. A concrete cut-off dam joins the north upper entrance wall of the lock to the flooded contour on that side.

The foundation of the lock and dams will be on rock or firm boulder drift. A hydro-electric plant at the north end of the river dam will supply the power for operating gates and valves, and for lighting the entrances to the lock above and below.

The reach above the Plain Chant lock is six miles long, very wide at the lower end, but narrow at its upper end. It lies between very high hills, with steep banks at some places near the upper end, where the confines of the river approach the nature of a canyon. No excavation will be necessary, and although some points of the upper end have only a width of 250 feet, the depth between them is very great.

ESTIMATE OF COST OF PLAIN CHANT REACH.

From Plain Chant to Les Epines—Mileage 320·3 to 326·5.

Plain Chant lock (single lock, 30 feet lift).		
Lock pit, rock, dry	$ 81,223	
Concrete	479,107	
Granite masonry	9,900	
Equipment and machinery	27,500	
Lock gates	103,612	
Approaches and fill:—		
Cribwork	236,658	
Fill under cribwork	3,431	
Fill behind lock walls and cribwork	114,475	
		$1,055,906
Dam:—		
Plain Chant dam:—		
Concrete, first-class	$106,785	
Concrete, second class	93,649	
Excavation, rock, dry	6,358	
Superstructure	38,724	
Unwatering	20,392	
		265,908
Channel:—		
Canal prism, rock, dry	$82,291	
" " wet	30,513	
" earth, wet	10,248	
Lighting:—		
Lighthouses (three)	2,250	
Range lights (one pair)	1,500	
Guide cribs (three)	4,976	
		131,778
		$1,453,592

LES EPINES REACH.

At mileage 327 are the 'Les Epines' and the Larose rapids, having a fall of about 9 feet. At the head of the Larose rapid the Amable du Fond river enters the Mattawa from the south. Above these rapids the river is very narrow in many places, is tortuous and contains four sets of minor rapids.

At four and a half miles above the Larose rapid, at the Paresseux falls, the river turns abruptly to the south at the end of a very narrow gorge between high and rocky walls through which it is known as Deep river.

With a lift of 17 feet at Les Epines rapid the reach above as far as the Paresseux falls is raised to elevation 557, or about 31 feet above its present surface at the mouth of the Amable du Fond river, and 25 feet above its present surface at the upper end of the Deep river. This will obliterate the rapids above, allow slack water navigation, and permit a sufficient canal width to be obtained without abnormal excavation, and will not require dams to prevent overflow at other points. This will be accomplished by a dam between the Larose and Les Epines rapids, and a lock with cribwork approaches on the north side. Both dam and lock will be of solid concrete on rock and hard pan foundation, the lock being of a floor culvert type. The dam will be of the overflow type maintaining the pool above at elevation 557. Some excavation will be required between the approaches to the lock and at scattered points above.

This reach is remarkably straight, having but one change of direction, which is a one-eighth bend on a curvature of two degrees and occurs at Bouillon lake, where the river is very wide.

ESTIMATE OF COST OF LES EPINES REACH.

From Les Epines to Lower Paresseux,—Mileage, 326·5 to 331·5.

Les Epines lock (single lock, 17 feet lift).			
Lock pit, rock, dry..		$ 13,985	
" earth, dry		87,950	
Concrete..		463,312	
Granite masonry..		8,850	
Equipment :—			
Power plant..	$ 7,500		
Electric power equipment..	5,000		
Electric light equipment..	2,000		
Bailing outfit..	2,000		
Machinery valves..	11,000		
Lock gates..		27,500	
Approaches and fill :—		86,555	
Cribwork..			
Fill under cribwork..		324,087	
Fill behind lock walls and cribwork..		18,447	
		4,842	
Dam—Les Epines dam :			$1,035,528
Concrete, first class..		$32,332	
" second class..		27,306	
Excavation, rock, dry..		1,883	
Superstructure..		13,580	
Unwatering..		16,248	
			91,349

Channel:—		
Excavation :—		
Canal prism, rock, dry	$ 160,734	
" earth, dry	66,465	
Lighting :—		
Lighthouses (2)	8,769	
Guide cribs (10)	11,550	
" with lights (8)	10,045	
Lanterns (2)	500	
		258,063
		$1,379,940

UPPER MATTAWA RIVER.

The Paresseux falls is as far as it is possible to canalize the Mattawa river below Lake Talon. The range of hills which confine the Mattawa river on the west, above the Ottawa river, turns abruptly to the east at this point, throwing a rock divide between the river below and Talon lake above.

To follow the natural course of the river above the Paresseux falls to Talon lake is out of the question, considering a canal of the intended magnitude.

By the river, two very abrupt turns of 90 degrees, each in opposite directions, occur within 1½ miles above the Paresseux. One turn is confined within narrow limits by high, granite walls, and the other would require much excavation to obtain sufficient area at grade. The remainder of the river between Paresseux and Talon lake is likewise restricted. Moreover, the lift between the proposed levels of the two pools —Deep river and Talon lake—is 120 feet, all of which would have to be overcome within limits too extreme to permit of the river route being considered.

PARESSEUX FLIGHT AND REACH.

The problem is solved in its most economical sense by cutting a practically straight canal from the upper end of Deep river, at the foot of the Paresseux falls, through the divide to Talon lake, placing therein the necessary locks to overcome the difference of level.

Leaving the Deep river one-half mile below the Paresseux falls, the canal enters the side slope of the hills, where a pair of locks in flight of 30 feet lift each will carry the canal up 60 feet, or from elevation 557 to elevation 617.

Here a natural basin is taken advantage of to form a pool between the flight just mentioned and another flight of two locks 1½ miles above, having a similar lift of 60 feet. This will bring the canal to the adopted or raised level of Talon lake, or what will be known as the Summit level at elevation 677.

From the upper flight to Talon lake a canal cut through rock ranging from 15 to 20 feet in depth, 250 feet wide and 1½ miles long, will complete the connection between the Deep river of the Mattawa and the Summit level.

Both pair of the flight locks above mentioned will be of concrete throughout, and will rest within walls of solid rock. Between the lower approach cribs to both flights of locks and for about one-half mile in the basin between them, heavy rock excavation will be required. The basin between the flights will have a requisite width for passing vessels.

Both flights of locks will be operated by culverts through the side walls and double sets of gates in each, similar to those at the Rocher Capitaine flight, will control the changes of level.

Hydro-electric power for operating the gates and valves of both flights and for lighting the canal between the Deep river below and Talon lake above, will be developed at the foot of the lower flight, drawing its supply of water from the basin above.

Regulation of the basin to elevation 617 is obtained by sluice gates situated in a natural waterway connecting it with the canal at the Summit level above the upper flight of locks.

ESTIMATE OF COST OF LOWER PARESSEUX REACH.

From Lower Paresseux to Upper Paresseux,—Mileage 331·5 to 332·9.

Lower Paresseux locks (flight of 2 locks, 30 feet lift each).		
Lock pit, rock, dry	$ 251,342	
" earth, dry	9,611	
Concrete	1,095,697	
Granite masonry	15,300	
Equipment and machinery	46,000	
Lock gates	173,663	
Approaches and fill:—		
Cribwork	147,630	
Fill under cribwork	1,291	
Fill behind lock walls and cribwork	85,108	
		$1,825,642
Dam :—		
Concrete, first class	$76,375	
" second class	73,012	
Excavation, rock, dry	5,086	
" earth, dry	4,234	
Superstructure	25,676	
		184,383
Channel:—		
Excavation :—		
Canal prism, rock, dry	$ 471,684	
" earth, dry	37,955	
Guide cribs (two)	3,472	
		513,111
		$2,523,136

SUMMIT LEVEL.

The canal line above the upper flight of the Paresseux locks, enters the Summit level which extends from mileage 334 to mileage 357½. The Summit will embrace Lake Talon, the Little Mattawan river, Turtle and Trout lakes, their present surfaces being raised to elevation 677.

Talon lake will be raised 41 feet and Trout and Turtle lakes about 15 feet above their present levels. Thi will be accomplished by a dam at the foot of Talon lake, above the Talon chute at the lower end, and ten small earth dams around the head of Trout lake at the upper end. The raised water surface is well contained within high hills all round and no damage will be incurred therefrom.

The dam at Talon chute will have a length of about 1,100 feet, will be on rock foundation throughout, and of the crest overflow type which will afford the necessary regulation to the Summit level.

When raised to the proposed level Talon lake will allow eight miles, and Trout lake seven miles of free navigation. At the lower end of Trout lake, at many points in Turtle lake and throughout the Little Mattawan river, from the foot of Turtle to Whitefish lake, considerable rock excavation will be necessary to obtain the required width of 300 feet in submerged cutting.

The upper end of Trout lake lies three and a half miles northeast of Lake Nipissing, the height of land passing between. The canal through this divide to the lock at the west end of the Summit level will require very heavy excavation, a large percentage of which will be in rock. It will be about two and a quarter miles in length and 250 feet bottom width in its restricted parts; four small lakes between Trout and Nipissing lakes, together with the valleys connecting them, are taken advantage of for this location. Many changes of direction will occur in the different channels throughout the Summit, the curvature nowhere exceeding two degrees.

At one and one-eighth miles northeast of the Nipissing shore the North Bay lock at the west end of the Summit, with a lift (or in this description a fall) of 29 feet, will bring the canal to elevation 648, or that to which it is proposed to maintain the level of Lake Nipissing. This lock will be of concrete in solid rock, operated by culverts under the floor, controlled by butterfly or roller-bearing valves and having cribwork approaches at either end.

A bascule road bridge across the lower wall will afford highway crossing. This lock will be operated, and the three and a half miles of canal between Trout and Nipissing lakes, will be lighted by a producer gas electric plant.

ESTIMATE OF COST OF SUMMIT LEVEL.

Upper Paresseux Reach, from Upper Paresseux to North Bay—Mileage 332·9 to 358·2.

Upper Paresseux lock (flight of 2 locks, 30 feet lift each).		
Lock pit, rock, dry	$ 373,376	
Concrete	1,081,522	
Granite masonry	15,950	
Equipment and machinery	46,000	
Lock gates	184,947	
Approaches and fill :—		
Cribwork	146,301	
Fill under cribwork	11,911	
Fill behind lock walls and cribwork	45,054	
		$1,905.061

Dams and regulating culvert:—		
Talon Chute dam :—		
Concrete, first class..	$74,070	
Concrete, second class..	65,515	
Excavation, rock, dry..	4,137	
Superstructure..	31,500	
Unwatering..	13,190	
Upper Paresseux dam :—		
Concrete, first class..	24,465	
Concrete, second class..	13,657	
Excavation, rock, dry..	1,626	
" earth, dry..	148	
Superstructure..	19,404	
Concrete..	6,375	
Two 'Stoney gates'..	4,200	
		258,287
Channel:—		
Excavation:—		
Canal prism, rock, dry..	$5,085,223	
" earth, dry..	254,497	
Lighting :—		
Lighthouses (6)..	8,764	
Guide cribs (25)..	25,063	
" with lights (20)..	26,532	
Range lights (2 pairs)..	3,000	
		5,403,079
Dams Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 :—		
Excavation, earth, dry..	$ 9,289	
Earth fill..	10,687	
Puddle..	12,273	
		32,249
North Bay lock (single lock, 29 feet lift).		
Lock pit, rock, dry..	139,722	
" earth, dry..	2,739	
Concrete..	320,325	
Granite masonry..	10,150	
Equipment and machinery..	27,500	
Lock gates..	106,470	
Approaches, cribwork..	147,885	
		754,791
Damages :—		
Talon lake and Kabuskong..	$10,000	
Bridges :—		
Callender, high road at North Bay lock, rolling lift..	10,000	
		20,000
		$8,373,467

AMABLE DU FOND FEEDER.

Elevation 677 is the highest to which the Summit lakes can be economically raised, and the available supply from the watershed, from the investigations of the hydraulic staff, will be 540 cubic feet per second throughout the season of navigation.

In the remote event of this supply being insufficient for the demand upon the Summit, the supply can be augmented by 700 cubic feet per second by diverting the Amable du Fond river from its present outlet into the Summit lakes, for an expenditure of $900,000.

AMABLE DU FOND FEEDER CANAL.

Proposition for the delivery of 700 cubic feet per second.

Dam at Gravelle chute :—		
Unwatering	$12,410	
Earth fill	33,626	
Rock fill	71,832	
Hand-laid wall	7,962	
Rip-rap	10,472	
Headworks of canal and regulating works at Gravelle chute :—		
Concrete	5,796	
Steel	292	
Cast iron	93	
Gates and operating machinery	1,000	
Flume work from Gravelle chute to Sparks creek :—		
Wooden flume	322,730	
Trestle work	36,240	
Earth excavation	6,139	
Lined open channel, approaches to and exits from tunnels :—		
Earth excavation	52,511	
Concrete lining	25,065	
Tunnel No. 1 :—		
Tunnelling, timbering, &c.	58,450	
Tunnel No. 2 :—		
Tunnelling, timbering, &c.	56,700	
Unlined open channel, head of Sparks creek :—		
Earth excavation	34,197	
Improvements to water course of Sparks creek.—		
From canal discharge to Talon lake	10,000	
	745,515	
Reservoirs (see below)	152,199	
		$897,714

Works necessary for reservoirs.—Hydraulic Investigations.

Dam at Mink lake :—		
Excavation, unwatering, concrete and sluices	$38,250	
Dam on Indian river (probable) :—		
Excavation, unwatering, concrete and sluices	23,048	
Dam at Three Mile lake :—		
Excavation, unwatering, concrete and sluices	16,377	
Dam at Tea Lake :—		
Excavation, unwatering, concrete and sluices	46,084	
Dam at Manitou Lake :—		
Excavation, unwatering, concrete and sluices	28,440	$152,199

NIPISSING REACH.

From the foot of the North Bay lock a submerged canal 300 feet wide extends for 1½ miles into the deep water of Lake Nipissing, part of which will be lined with cribwork. The material excavated will be 90 per cent sand and clay. The main line of the Canadian Pacific Railway will cross this canal ½ mile below the lock by a double leaf bascule bridge.

The Lake Nipissing reach extends from mileage 358 to mileage 388, affording free navigation for 30 miles at the one level.

A dam at the outlet of Lake Nipissing (the Chaudière Falls) will raise the present surface of the lake about 9½ feet to elevation 648. Damage from raised water from this level will occur at North Bay and vicinity, and at other towns on the lake shore, the total amount of which will be small.

The canal line across the lake will pass to the south of the Manitou islands and into the head of the French river at Frank's bay, continuing therein for 12 miles.

Some rock excavation to obtain channel width will be required at the lower end or just above the head of the next lock. This level will be regulated by 'Stoney sluices' in the dam at the head of the Big Chaudière rapid.

A lock of 24 ft. lift—or fall—immediately to the south of the Chaudière Falls at mileage 389½ will carry the canal to the level below, at elevation 624. The lock will be of concrete in solid rock and similar to the single locks before described; cribwork lining the approaches above and below.

Hydro-electric power developed at the foot of the lock will afford operation of the lock and light the approaches in the immediate vicinity.

ESTIMATE OF COST OF NIPISSING REACH.

From North Bay to Chaudière lock—Mileage, 358·2 to 389·9.

Channel :—		
Excavation :—		
Canal prism, rock, wet	$810,093	
" " dry	447,893	
" earth, wet	38,515	
" " dry	294,903	
Lighting :—		
Lighthouses (11)	12,957	
Guide crib (1)	778	
Lanterns (2)	500	
		$1,605,639
Chaudière lock (single lock, 24 ft. lift.)—		
Lock pit, rock, dry	$124,808	
Concrete	317,917	
Granite masonry	9,400	
Equipment and machinery	27,500	
Lock gates	95,266	
Approaches and fills :—		
Cribwork	185,724	
Fill under cribwork, rock	2,191	
Back fill behind walls and cribwork	47,500	
		810,306

Dams and regulation :—		
Little Chaudière (3 dams) :—		
Concrete	7,755	
Excavation, rock, dry	118	
Rock fill	841	
Unwatering	3,000	
Big Chaudière :—		
Concrete	$ 5,723	
Excavation, rock, dry	1,529	
Three 'Stoney gates' and 4 piers	57,253	
Unwatering	5,000	
		81,219
Entrance and dockage facilities at North Bay—		
Crib work, entrance Rocky Point	$ 418,428	
Dockage facilities at North Bay—cribwork (2,000 lineal feet)	96,999	
Rock filling behind cribwork	26,666	
		542,093
Damages—		
To land and buildings at Callender	$ 3,000	
" " North Bay	124,690	
Dockage at Callender	15,000	
" North Bay	5,000	
" Cache Bay	2,000	
" Sturgeon Falls	2,000	
Flooded land on Lake Nipissing shore	10,000	
Raising Canadian Pacific Ry. track at North Bay	6,000	
Bridges :—		
Canadian Pacific Ry. near North Bay, double track rolling lift	95,320	
		263,010
		$3,302,267

FIVE MILE RAPID REACH.

The reach below the Chaudière lock extends for 13 miles to the 'Five Mile Lock,' mileage 403, at its lower end. Open river navigation will prevail for 8 miles below the lower approach to the Chaudière lock where the river divides into the North and South channels, the canal line following the latter.

Between mileage 399 and 403 of this reach is the 'Five Mile Rapid,' with a fall of 14 feet, all of this rapid is eliminated by raising the present water surface to elevation 624, or about 11 feet at its upper and 25 feet at its lower end. Considerable rock excavation is required at the lower entrance to the Chaudière lock and several points within 1½ miles below it, will have to be cut through.

Along the Five Mile Rapid heavy excavation in rock will be necessary to obtain the canal width of 250 feet. Many changes in direction of the canal line occur throughout this level, in none of which will the curvature exceed two degrees.

At the foot of the 'Five Mile Rapid'—the Little Parisian Rapid—a lock on the south side of the river effecting a change of level of 24 feet gives access to the reach below at elevation 600. This lock will be mostly contained with rock walls and all on rock foundation. A rock and earth-filled dam in the main river to the north of the lock will maintain the level above and stop-log sluices across a channel cut to the south of the lock, and contained in a concrete and timber dam, which blocks the north channel about midway of its length, affords the necessary regulations.

This lock will be of concrete with floor culverts and gates similar to those before described. Hydro-electric power for operation and light being developed at the foot of the dam.

ESTIMATE OF COST OF FIVE MILE RAPID REACH

From Chaudière Lock to Five Mile Rapid—Mileage, 398·9 to 403·4.

Channel :—		
Excavation :—		
Canal prism, rock, wet	$1,183,301	
" " " dry	930,008	
Unwatering Five Mile Rapid	4,500	
Lighting :—		
Lighthouses (3)	2,250	
Guide cribs (26)	11,393	
" with lights (29)	29,329	
		$2,160,781
Five Mile Rapid Lock (Single Lock 24 ft. lift.)		
Lock pit, rock, dry	$ 92,269	
Concrete	420,000	
Granite masonry	9,400	
Unwatering	14,000	
Equipment and machinery	27,500	
Lock gates	95,266	
Approaches and fills :—		
Crib work	188,685	
Rock fill under crib	20,186	
Back fill behind lock wall and cribwork	65,000	
		932,306

Dams and regulation :—		
Eighteen Mile Island :—		
Concrete	$11,940	
Excavation, rock, dry	1,138	
Timber	1,472	
Steel	2,581	
Car and lifting gear	420	
Timber dam	1,233	
Unwatering	5,000	
Five Mile Rapids :—		
Concrete	7,005	
Excavation, rock, dry	6,464	
Timber	1,105	
Steel	2,032	
Car and lifting gear	420	
Rock fill	27,075	
Earth fill	1,881	
		69,766
		$3,162,853

PICKEREL RIVER REACH.

The reach below the 'Five Mile Rapid' lock extends for 37 miles, to mileage 440. Thirty-one miles afford free navigation, the remainder being in submerged channels and cuttings at scattered points along the route.

At mileage 414, 11 miles below the Five Mile Lock, the canal line leaves the French river and crosses to the Pickerel river following an improved natural waterway, the Pickerel river being better suited for canalization than the French river below this point.

Very heavy excavation will occur between mileage 414 and 417½, where the improvements are required to connect the two rivers, particularly at the junction with the Pickerel river (Horseshoe Falls).

At mileage 421 the Pickerel river is crossed by the Toronto-Sudbury branch of the Canadian Pacific Railway on a single track through truss steel bridge. This would have to be replaced by a double leaf bascule bridge.

Some excavation is required along the side through the 'Cross-Narrows' between mileage 421 and 423½, to obtain the necessary width. A cut through an island at mileage 426 will give a submerged channel of ½ mile in length. At mileage 430 the Pickerel river is crossed by a through truss steel bridge of the James Bay Railway, which will require to be replaced by a bascule bridge.

Three miles below this crossing the French and Pickerel rivers join in Le Bœuf lake.

In the last two miles of this reach approaching the lower lock considerable excavation occurs, where different points projecting into the river will have to be removed.

The level of this reach is raised to elevation 600, or about 6 ft. above its present surface, above the Horshoe Falls and about 14 feet below; this is accomplished by 4 dams which block the outlets of the French river into the Georgian Bay. These dams are all of concrete in solid rock and are of the crest overflow type for the regulation of this level; no damages resulting from the raised water.

Many changes in direction occur in the channels throughout this reach, all being of easy curvature.

In the cutting at the Horseshoe Falls a quarter bend is necessary in ½ mile, or on a curvature of 5 degrees; a basin here of 400 feet bottom width will allow the necessary space.

At mileage 440 the Dalles lock, with a drop of 22 feet, will carry the canal to the Georgian Bay level at elevation 578. This lock will be of concrete on rock foundation and be operated by culverts through the side walls. It will be situated in the middle of the river, having long crib work approaches above and below, and concrete dams will join its upper walls to the rocky banks of the river on each side.

The lock will be electrically operated and the approaches for two miles above and below will be lighted by power to be derived at the lock site.

Some excavation will be necessary in the river below the lock to obtain a bottom width of 300 feet. Some additional cribwork in the river two miles below the lock will complete the work on this level.

All submerged channels at points along the canal line of the Nipissing district are defined at short intervals by piers of cribwork, some of which carry lights, and all the courses of the main channel are defined by lighthouses or range lights or both.

ESTIMATE COST OF PICKEREL REACH.

From Five Mile Rapid lock to Georgian Bay—Mileage 403·4 to 442·6.

Channel (to mile 440·5) :—			
Excavation :—			
Canal prism earth, dry		$ 19,476	
" rock, wet		2,626,298	
" " dry		1,010,282	
Unwatering Horseshoe		7,500	
Lighting :—			
Lighthouses (19)		16,522	
Guide cribs (21)		9,753	
" with lights (56)		37,007	
Lanterns (2)		500	
Range lights (3 pairs)		4,500	
			$3,731,838
Dalles lock (single lock, 22 ft. lift) :—			
Lock pit, rock, dry		$ 9,515	
Concrete		603.487	
Granite masonry		11,100	
Equipment :—			
Power plant	7,500		
Electrical power equipment	5,000		
Electric light "	2,000		
Bailing outfit	2,000		
Machinery valves	11,000		
		27,500	
			$ 27,500
Lock gates		92.665	
Unwatering lock and dam		121,000	
Approaches and fills :—			
Cribwork		345,000	
Fill under cribwork		29.753	
Back fill behind lock wall and cribwork		200,000	
Dams :—			$1,440,020
Dalles Lock dam :—			
Concrete		69,848	
Excavation, rock, dry		1,007	
Tramway Point dam :—			
Concrete		7,035	
Excavation, rock, dry		154	
" earth, dry		17	
Unwatering		1,009	
Bass creek dam :—			
Concrete		53,663	
Excavation, rock, dry		719	
" earth, dry		332	
Unwatering		3,500	
Bad river dam :—			
Concrete		64,500	
Excavation, rock, dry		476	
Unwatering		2,500	

Eastern outlet :—		
Concrete	15,098	
Excavation, rock, dry	577	
Unwatering	3,500	
		223,926
Damages :—		
Bridges :—		
Canadian Pacific Ry. crossing, Pickerel river	$ 150,000	
James Bay Ry. crossing Pickerel river	180.000	
		$ 330,000
Entrance French river (mileage 440·5 to 442·6.)—		
Excavation :—		
Canal prism, rock, wet	$ 736.561	
" " dry	1,712	
Lighting :—		
Range lights (1 pr.)	1,800	
Lanterns (2)	500	
Approaches :—		
Cribwork	45,267	
		785,840
		$6,511,624

BACK RIVER ROUTE—ESTIMATE PRAIRIES REACH (BACK RIVER).

Ship Channel to Sault Recollet—Mile 0 to 17—Surface elevation, 40—St. Lawrence below, 16—Lift, 24 ft.—Alternative Route back of Montreal Island.

Prairies lock :—		
Excavation, rock	$ 68,400	
Unwatering pit	10,000	
Concrete, lock walls, &c.	319,000	
Entrance piers	286,700	
Lock gates	93,000	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$ 812,900
Dams and regulation :—		
Embankments, rock and earth	$52,200	
Regulating sluices	62,000	
		114,200
Channel :—		
Excavation, rock, wet	$2,954,300	
" " dry	202,000	
" earth, wet	808,400	
" " dry	179,000	
Bank protection	8,000	
Lights and marks	44,400	
		4,196,100
Damages :—		
Land and rights	$454,600	
Bridging	120,000	
		574,600
		$5,697,800

The Back river line leaves the channel near Varennes and passes Bourbon island at Bout de l'Ile up to Des Prairies village. The width is 300 feet widened at curves and 4 million cubic yards of soft dredging is required.

Prairies lock is at the head of this channel, 8 miles from the ship channel. The lock, dam and sluices are founded on solid rock.

Visitation island at the head of this reach obstructs the channel, and nearly a million cubic yards of rock must be removed to enlarge the river and allow the natural flow to pass at moderate speed.

BACK RIVER ROUTE—ESTIMATE RECOLLET REACH.

Sault Recollet to Pointe Fortune—Mile 17 to 49—Surface elevation, 75—Surface below, 40—Lift, 35 ft.—Alternative Route back of Montreal Island.

Recollet lock:—		
Excavation, rock and earth	$94,900	
Unwatering pit	10,000	
Concrete, lock walls, &c.	532,400	
Entrance piers	462,000	
Lock gates	110,800	
Valves, motors and lights	25,800	
Bollards, life chains, &c.	10,000	
		$ 1,245,900
Dams and regulations:—		
Regulating sluices	$367,900	
		367,900
Channel:—		
Excavation, rock, wet	$1,614,000	
" " dry	408,000	
" earth, wet	1,003,000	
" " dry	1,870,400	
Embankments, rock and earth	501,400	
Bank protection	212,000	
Lights and marks	40,700	
		5,649,500
Damages:—		
Land and rights	$373,300	
Bridging	140,000	
		513,300
		$7,776,600

Above the lock is a canal 11 miles (17—28) long and 200 feet wide up to the entrance of Oka lake. Through the east end of the lake, there is 4½ million cubic yards of sand dredging (miles 28—37). The line from Oka village to Pointe Fortune corresponds with the Montreal or front route.

These two routes compare in cost as follows:—

Montreal, Ste. Anne to Pointe Fortune	$18,746,000
Ship channel, Back river to Pointe Fortune	13,474,400
Difference	$5,271,600

From a common terminal at Pointe Fortune, the time of transit by the Back river will be 8 hours to the ship channel, at the foot of the Island of Montreal, and the time by Ste. Anne and Lachine to the Custom House at Montreal, 7½ hours. There is one lock less by Back river.

The Back river from St. Genevieve to Sault Recollet will remain in its natural condition.

SUMMARY OF ESTIMATED COST.

ALTERNATIVE ROUTES.

BACK RIVER SECTION.

—	Lock	Dam.	Regulation.	Channel.	Damages.	Totals.
	$	$	$	$	$	$
Bout de L'Ile Reach	....	....	....	1,430,700	120,000	1,550,700
Prairies Reach	812,900	52,200	62,000	2,765,400	454,600	4,147,100
Recollet Reach	1,245,900	....	367,900	5,649,500	513,300	7,776,600
	2,058,800	52,200	429,900	9,845,600	1,087,900	13,474,400

CALUMET CHANNEL SECTION.

Portage du Fort Reach	919,400	471,000	125,200	298,100	132,800	1,946,500
Mountain Reach	1,123,800	99,600	92,500	171,700	6,000	1,493,600
Coulonge Reach	704,100	43,700	118,800	1,470,000	94,700	2,431,300
	2,747,300	614,300	336,500	1,939,800	233,500	5,871,400

HENNESSEY BAY SECTION.

Coulonge Reach	1,052,300	448,000	140,500	2,199,500	4,700	3,845,000
Pembroke "	1,097,500	50,700	79,400	3,778,300	185,300	5,191,200
	2,149,800	498,700	219,900	5,977,800	190,000	9,036,200

CULBUTE CHANNEL SECTION.

Coulonge Reach	1,052,300	448,000	140,500	3,149,500	24,700	4,815,000
Pembroke "	826,100	181,300	93,200	1,198,600	153,800	2,453,000
	1,878,400	629,300	233,700	4,348,100	178,500	7,268,000

McCONNELL LAKE SECTION.

Mackey Reach	1,500,200	156,400	53,600	1,376,000	15,000	3,101,200

NOTE.—Figures for Calumet, Hennessey Bay and Culbute alternative routes are not final and may be revised.

SUMMARY OF ESTIMATED COST, BY REACHES.

(VIA. LAKE ST. LOUIS.)

—	Mile.			Locks.	Dams and Regulation.	Channels.	Damages.	Totals.
				$	$	$	$	$
Montreal Reach	0	to	5	1,090,700	64,000	1,352,300	1,352,000	3,859,000
St. Louis Reach	5	"	25	1,093,000	12,200	11,070,800	377,000	12,553,000
Oka Reach	25	"	40	784,800	360,800	937,300	251,100	2,334,000
Pointe Fortune Reach	40	"	60	1,477,400	361,900	1,880,900	140,600	3,860,800
Ottawa Reach	60	"	121	889,600	307,800	3,750,900	1,221,500	6,169,800
Hull Reach	121	"	122	929,700	5,700	730,400	658,000	2,323,800
Aylmer Reach	122	"	154	673,700	406,600	2,938,800	1,580,000	5,599,100
Arnprior Reach	154	"	174	818,200	477,700	1,421,400	28,300	2,745,600
Portage du Fort Reach	174	"	187	919,400	586,200	333,900	192,800	2,032,300
Rocher Fendu Reach	187	"	190	1,071,800	352,400	49,400	8,200	1,481,800
Coulonge Reach	190	"	209	1,052,300	588,500	2,294,900	4,700	3,940,400
Pembroke Reach	209	"	265	1,030,800	209,600	2,984,500	175,300	4,400,200
Des Joachims Reach	265	"	284	1,419,123	87,895	1,198,365	20,200	2,725,583
Rocher Capitaine Reach	284	"	296	2,028,428	495,383	1,394,089	......	3,917,900
Deux Rivières Reach	296	"	318	965,058	452,447	870,516	182,400	2,470,421
Mattawa Reach	318	"	320	874,357	171,321	321,087	138,760	1,505,525
Plain Chant Reach	320	"	326	1,055,908	265,906	131,778	......	1,453,592
Les Epines Reach	326	"	331	1,035,528	91,349	253,063	......	1,379,940
Lower Paresseux Reach	331	"	333	1,825,642	184,383	513,111	......	2,523,136
Summit Reach	333	"	358	2,659,852	290,536	5,403,079	20,000	8,373,467
Nipissing Reach	358	"	390	810,306	81,219	2,147,732	263,010	3,302,267
Five Mile Rapid Reach	390	"	403	932,306	69,766	2,160,781	......	3,162,853
Pickerel Rapid Reach	403	"	442	1,440,020	223,926	4,517,678	330,000	6,511,624
				26,977,926	6,067,533	48,706,379	6,883,870	88,626,106
				30%	7%	55%	8%	

Construction of locks, dams, channels, piers, lighting, damages	88,626,106
Contingencies, engineering, administration, say 10%	8,862,892
Storage of flood waters and regulation basins, telephones, &c	2,200,000
Total	99,489,000
Feeder at Summit, when required	900,000

SUMMARY OF ESTIMATE OF COST, BY ITEMS.

ROUTE A.—(See Page 7.)

Description.		Quantity.	Unit Prices.	Cost.
Rock, excavation, submarine	cubic yds.	8,322,554	$1.50, $3.00 and $3.50	$22,982,790
Rock, excavation, dry	"	18,574,696	$1.00 and $1.50	19,567,750
Earth, excavation, dredging	"	8,935,667	20, 25, 30 and 35 cts.	2,140,073
Earth, excavation, dry	"	10,836,337	20, 30, 35 and 45 cts.	3,223,000
Concrete in dams, locks and entrance piers	"	1,841,399	$ 7.50	13,810,493
Concrete in dams, second class	"	60,698	4.50	273,130
Granite masonry in locks	"	2,474	50.00	123,700
Rock fill work, (dams, embankments and behind cribs and walls)	"	7,880,672	0.50	3,940,336
Rock fill work, (rip-rap and borrow pit)	"	510,098	1.00	510,098
Bank lining	"	114,300	2.00	228,600
Earth fill, (dams, embankments and back of walls)	"	3,770,078	5, 10, 15, 25, 40, 50 and 60 cts.	984,229
Cribwork	"	1,910,102	$3.00 and $3.50	6,191,405
Timber mattress	"	84,583	$1.35	114,186
Stop-logs, regulating works and machinery				1,848,080
Unwatering				254,976
Lock gates (steel)				2,610,108
Equipment and power				875,920
Bridges, railway crossings				1,463,893
Lighthouses, guide piers, lighting				879,734
Damages to land and water supply powers, drainage, railway and highway diversions, &c.				5,482,340
Total				$86,626,108
Contingencies, engineering, administration, say 10%				8,662,892
Storage of flood waters, regulation basins, telephones, &c.				2,200,000
Total				$97,489,000
Feeder at Summit, when required				900,000

ROUTE B.—(See page 7.)

Total estimated cost	$98,830,000

A COMPARISON OF SAND BAY LINE WITH L'AMABLE DU FOND ROUTE, BETWEEN LAKE TALON AND PLAIN CHANT LAKE.

—	Sand Bay Line.			L'Amable du Fond Route.		
Material.	Quantity.	Price.	Amount.	Quantity.	Price.	Amount.
	Cubic yds.	$	$	Cubic yds.	$	$
Rock, dry	2,767,957	1.10	3,044,753	3,065,610	1.10	3,372,171
" wet				15,000	3.50	52,500
Earth, dry	685,189	0.30	205,557	1,225,763	0.30	367,729
Rock fills	333,703	0.50	166,851	507,079	0.50	253,539
Rock fills (hand laid)	8,026	1.50	12,039			
Earth fills	10,792	0.25	2,698	214,340	0.25	53,585
Concrete	395,114	7.50	2,963,355	398,850	7.50	2,991,375
Crib work	225,318	3.00	675,954	215,955	3.00	647,865
C. P. R. diversion						380,480
Two swing bridges, road crossings						90,000
Road diversion near Eau Claire						2,000
			7,071,207			8,211,243

* Difference in favour of Sand Bay line .... $1,140,036.

ESTIMATE FROM NORTH BAY TO FOOT OF UPPER PARESSEUX WITH SUMMIT GRADE ELEVATION=626·2.

SUMMIT REACH LOWERED TO LAKE NIPISSING LEVEL.

Locality and Description.	Quantity.	Price.	Amount.
	cu. yds.	$ cts.	$
Excavation, Rock, Dry :—			
Canal prism (from final estimate)	4,614,858	1.10	5,076,344
New quantity through North Bay lock site	321,870	1 10	354,057
New quantity through changing grade from 651.0 to 626.0	9,333,148	1 20	11,199,778
New lock pit, Upper Paresseux (single)	134,500	1.10	147,950
Excavation, Earth, Dry :—			
Canal prism (from final estimate)	1,776,147	0 30	529,844
New quantity through North Bay lock site	14,741	0.30	4,422
Concrete :—			
Lock, Upper Paresseux, single (approx.)	70,000	7.50	525,000
Granite Masonry :—			
Lock, Upper Paresseux, single	198	50.00	9,900
Approaches and Fills :—			
Upper Paresseux, cribwork (approx.)	35,074	3.00	105,222
Dams :—			
Talon Chute—			
Concrete, 1st class	2,880	7 50	21,600
Concrete, 2nd class	2,016	4.50	9,072
Excavation, rock, dry (approx.)	1,880	1 10	2,068
Superstructure (lineal feet)	640	28 00	17,920
Unwatering			5,000
Equipment, machinery, lock gates, &c.			135,000
Bridges :—			
Canadian Pacific Ry. near North Bay			95,320
Callender, Highway (approx.)			30,000
Lighting			63,359
Damages			10,000
Dockage Facilities, North Bay :—			
Cribwork (2,000 lineal feet)	32,333	3 00	96,999
Rock fill behind cribwork	53,333	0 50	26,666
Total			18,465,515

In the project as adopted, the summit level embracing Trout Lake, Turtle Lake and Talon Lake is 29 feet above the raised level of Lake Nipissing. To cut down this summit to Lake Nipissing level would involve a very heavy expenditure as shown by above table.

The comparative estimated cost for both levels is as follows:

Summit level as projected (grade 651)	$ 9,713,933
Contingencies, engineering, etc., say 10%	971,393
Total	$10,685,326
Summit, cut down to Lake Nipissing level (grade 626)	$18,465,515
Contingencies, engineering, etc., say 10%	1,846,551
Total	$20,312,066

A difference of $9,626,740 in favour of the Trout and Talon lakes summit. From this should be deducted the feeder canal, estimated cost $900,000, which would not be required with Lake Nipissing as summit level.

NOTE.—In the above estimate for a summit grade of elevation 626, the material in excavation in Trout, Turtle and Talon lakes and through the Little Mattawan river was taken out as dry rock at a slight advance over the unit price set for dry rock elsewhere. This was based on the presumption that the natural barriers which hold the present levels could be blown out sufficiently to lower the water in the above pools to such a stage as to permit of this being done.

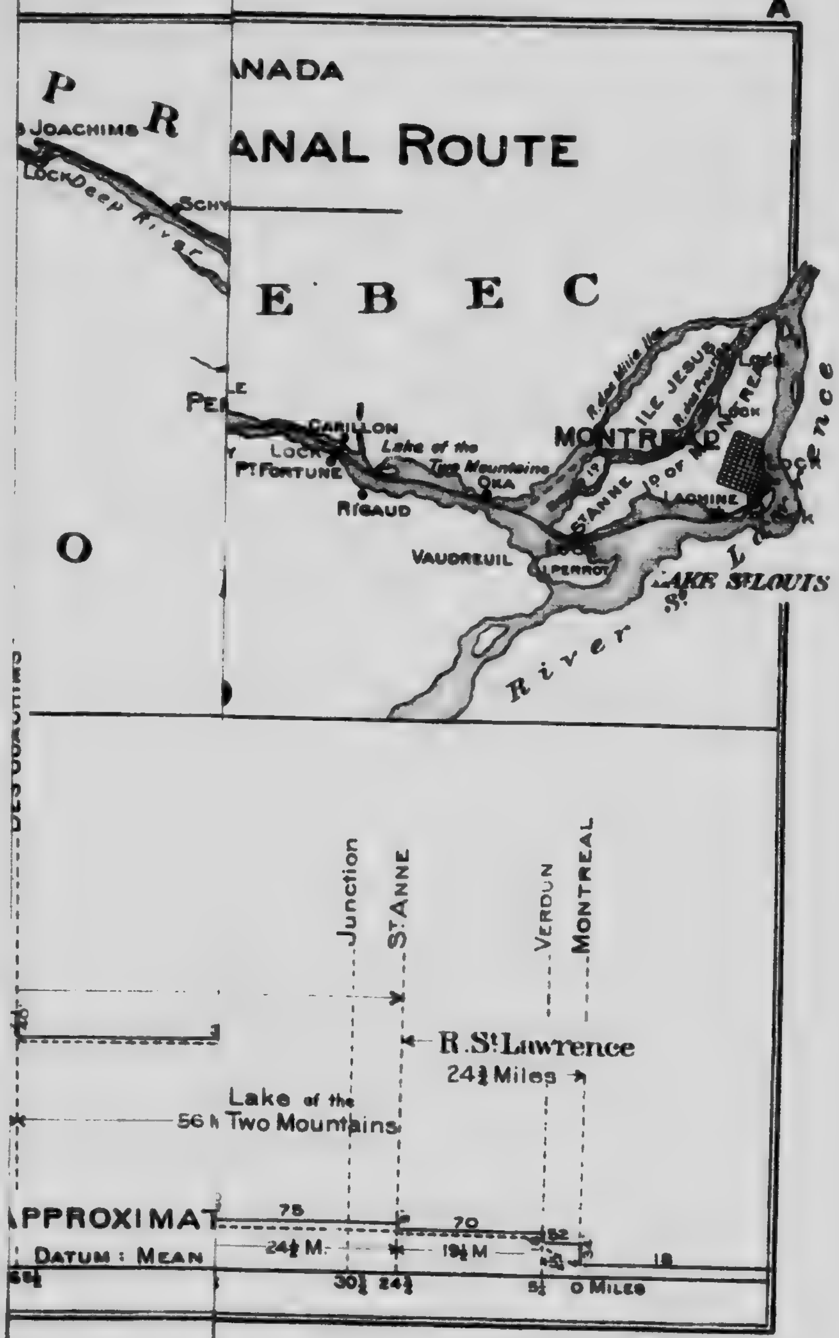
It is probable, however, that much of the material in excavation would remain submerged, which would serve to largely increase the cost of the summit taken at Lake Nipissing level.

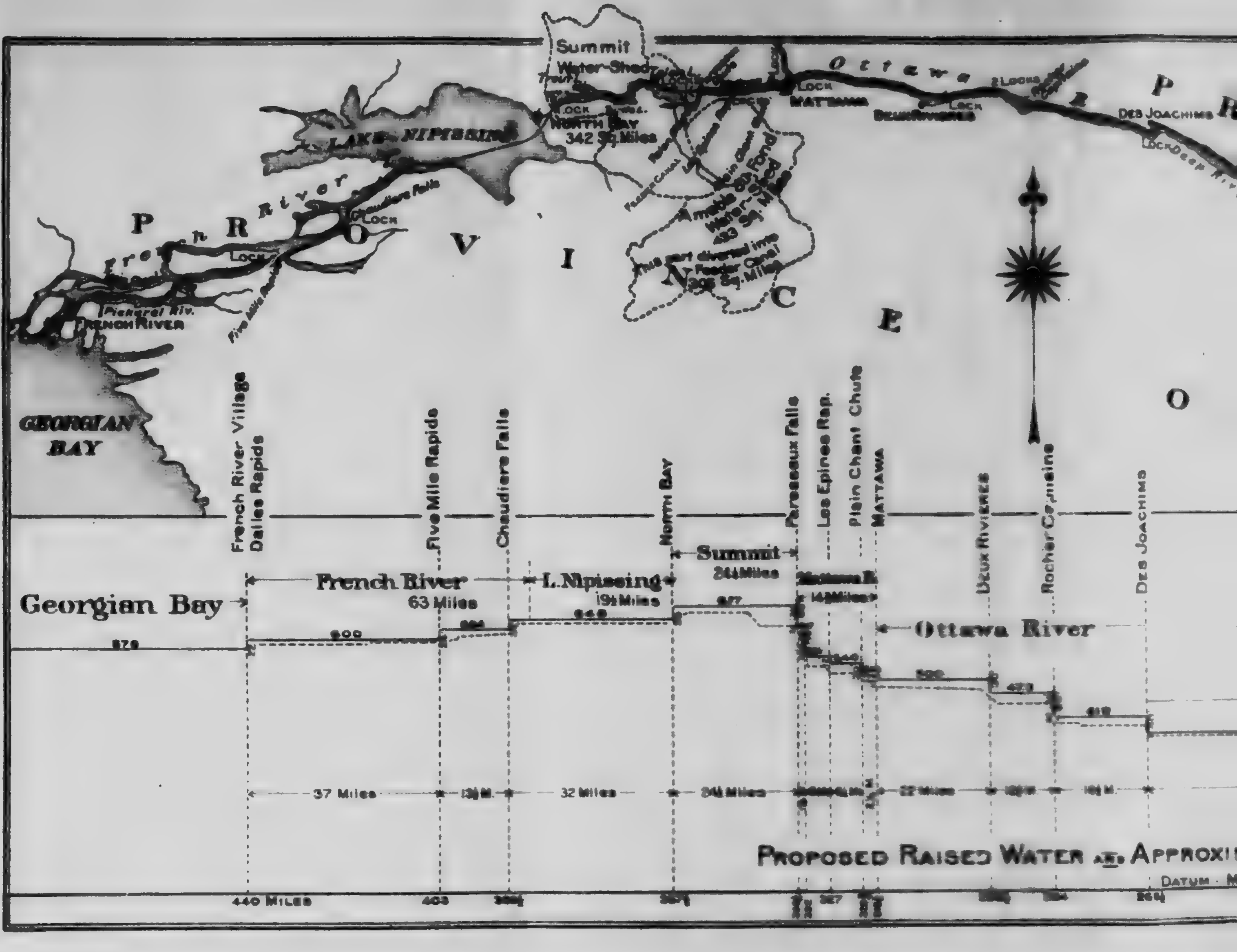
FRENCH RIVER SECTION.

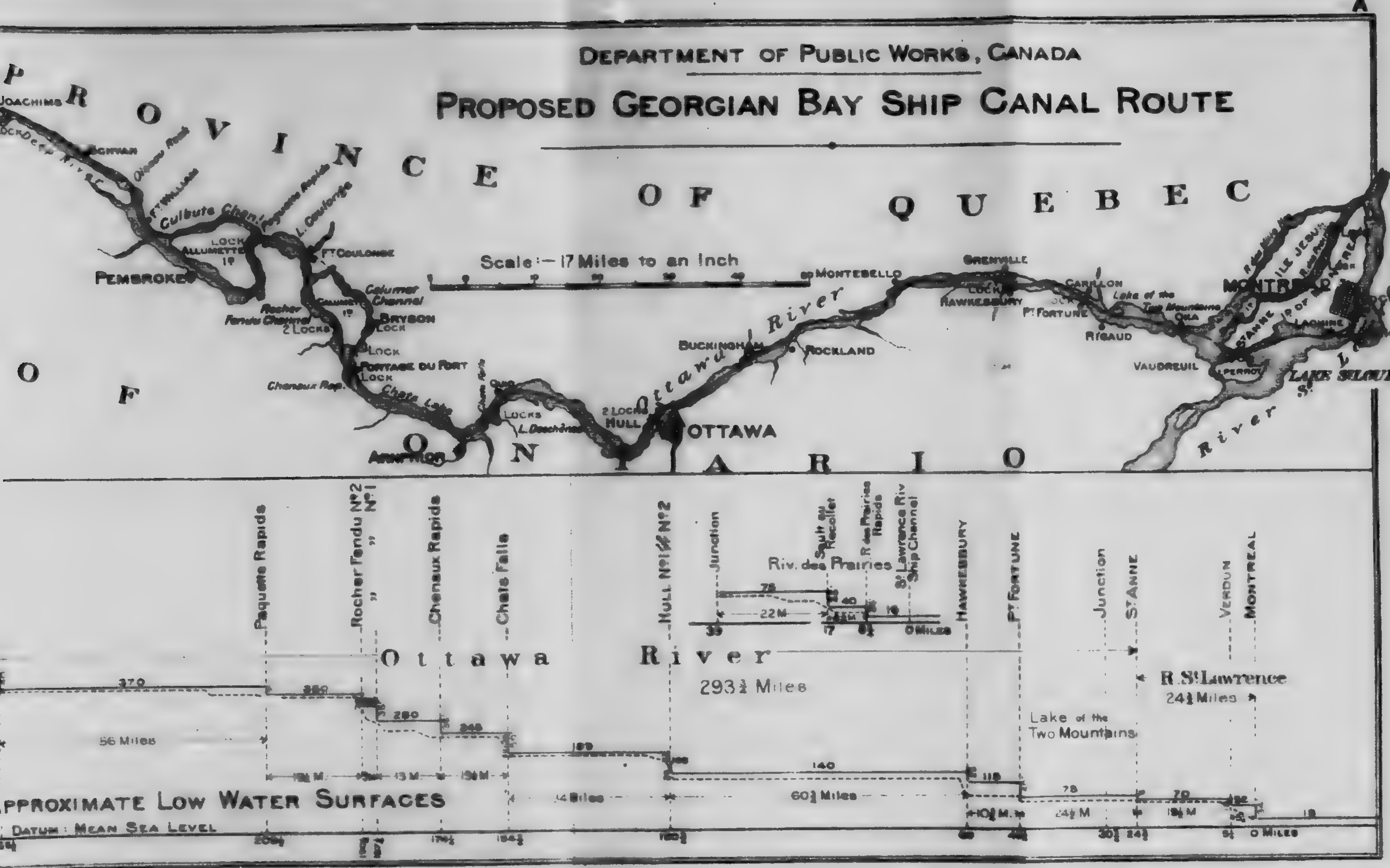
SUMMARY OF ESTIMATED COST.

North Bay to Lake Huron. Mileage 358·2 to 442 6.

Nipissing Reach (mileage 358.2 to 389.9)	$ 3,302,267
Five Mile Rapid Reach (389.9 to 403.4)..	3,162,853
Pickerel Reach & Lake entrance (403.4 to 442.6)....	6,511,624
	$ 12,976,744
Contingencies, engineering, administration, say 10%..	1,297,676
Total..	$ 14,274,420

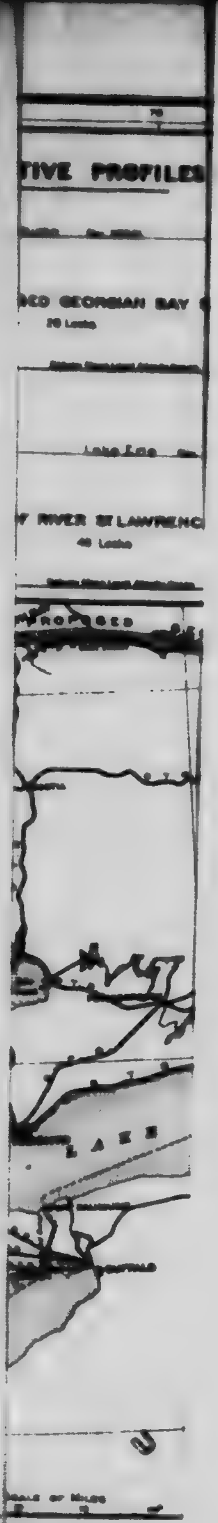

A
ANADA
ANAL ROUTE
P
R
JOACHIMS
LOCK
Deep River
SCHY
E B E C
PE
CARILLON
LOCK
Pt FORTUNE
RIGAUD
Lake of the Two Mountains
OKA
R. des Mille Iles
ILE JESUS
R. des Prairies
MONTREAL
I. of MONTREAL
LOCK
STE ANNE
LACHINE
LOCK
VAUDREUIL
I. PERROT
LAKE St LOUIS
River St Lawrence
O
DES JOACHIMS
Junction
St ANNE
VERDUN
MONTREAL
R. St Lawrence
24½ Miles
Lake of the Two Mountains
56 M
APPROXIMAT
DATUM : MEAN
75
70
52
18
24½ M.
19½ M
68½
30½
24½
5½
0 Miles

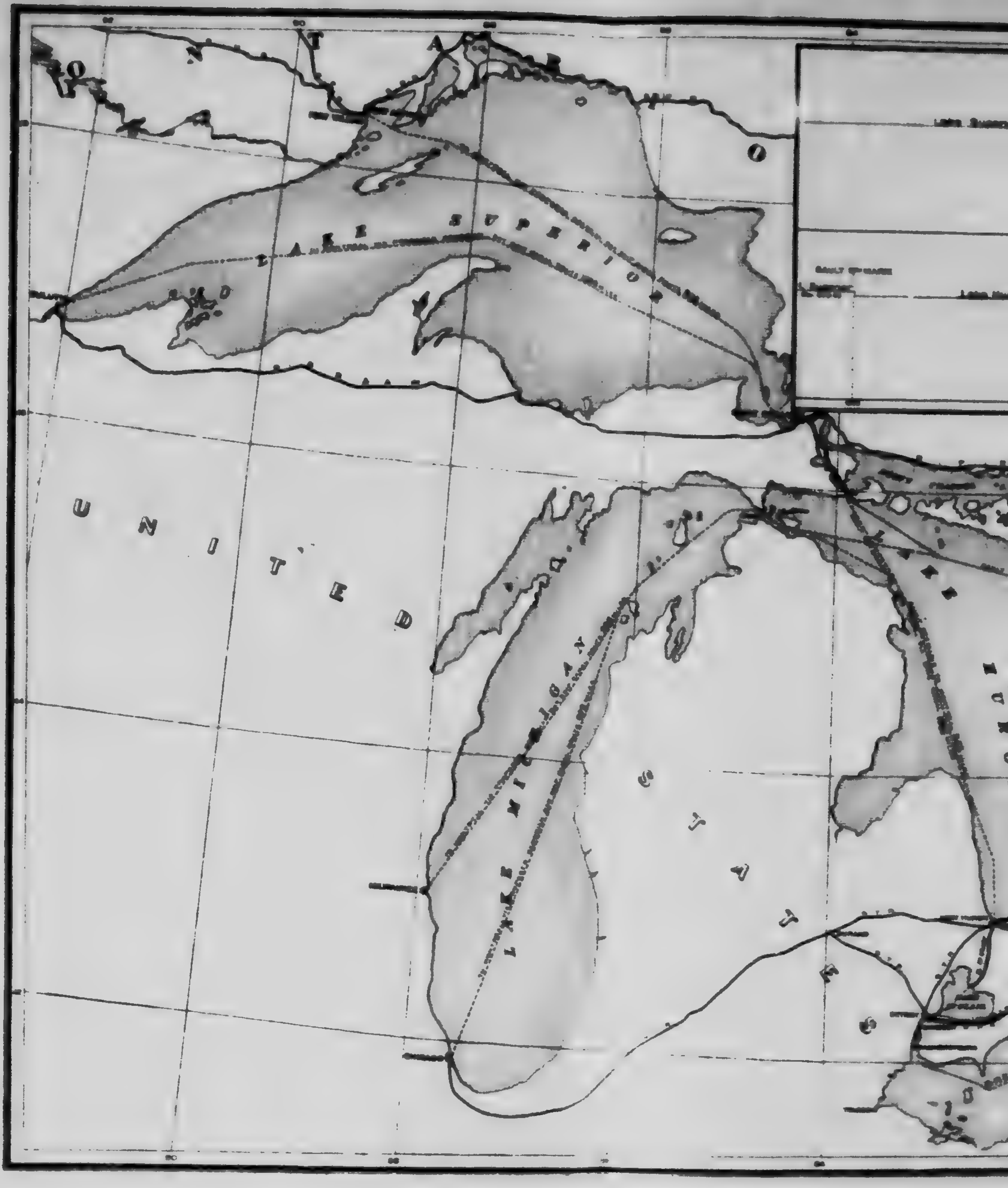

Summit Water-Shed
Lake Nipissing
North Bay 342 Sq. Miles
Ottawa River
Lock
Mattawa
Deux Rivieres
2 Locks
Des Joachims
Lock Deep River
French River
Chaudiere Falls
Pickerel Riv.
French River
Five Mile Rapids
Georgian Bay
Amable du Fond Water-Shed 433 Sq. Miles
This part diverted into Feeder Canal 306 Sq. Miles
P R O V I N C E O
P R
French River Village
Dalles Rapids
Five Mile Rapids
Chaudiere Falls
North Bay
Paresseux Falls
Les Epines Rap.
Plein Chant Chute
Mattawa
Deux Rivieres
Rocher Capitaine
Des Joachims
Georgian Bay
French River 63 Miles
L. Nipissing 19½ Miles
Summit 24½ Miles
Mattawa R. 14 Miles
Ottawa River
579
600
648
677
37 Miles
13½ M.
32 Miles
24½ Miles
22 Miles
16½ M.
440 Miles
403
327
264½
Proposed Raised Water and Approxi
Datum · M



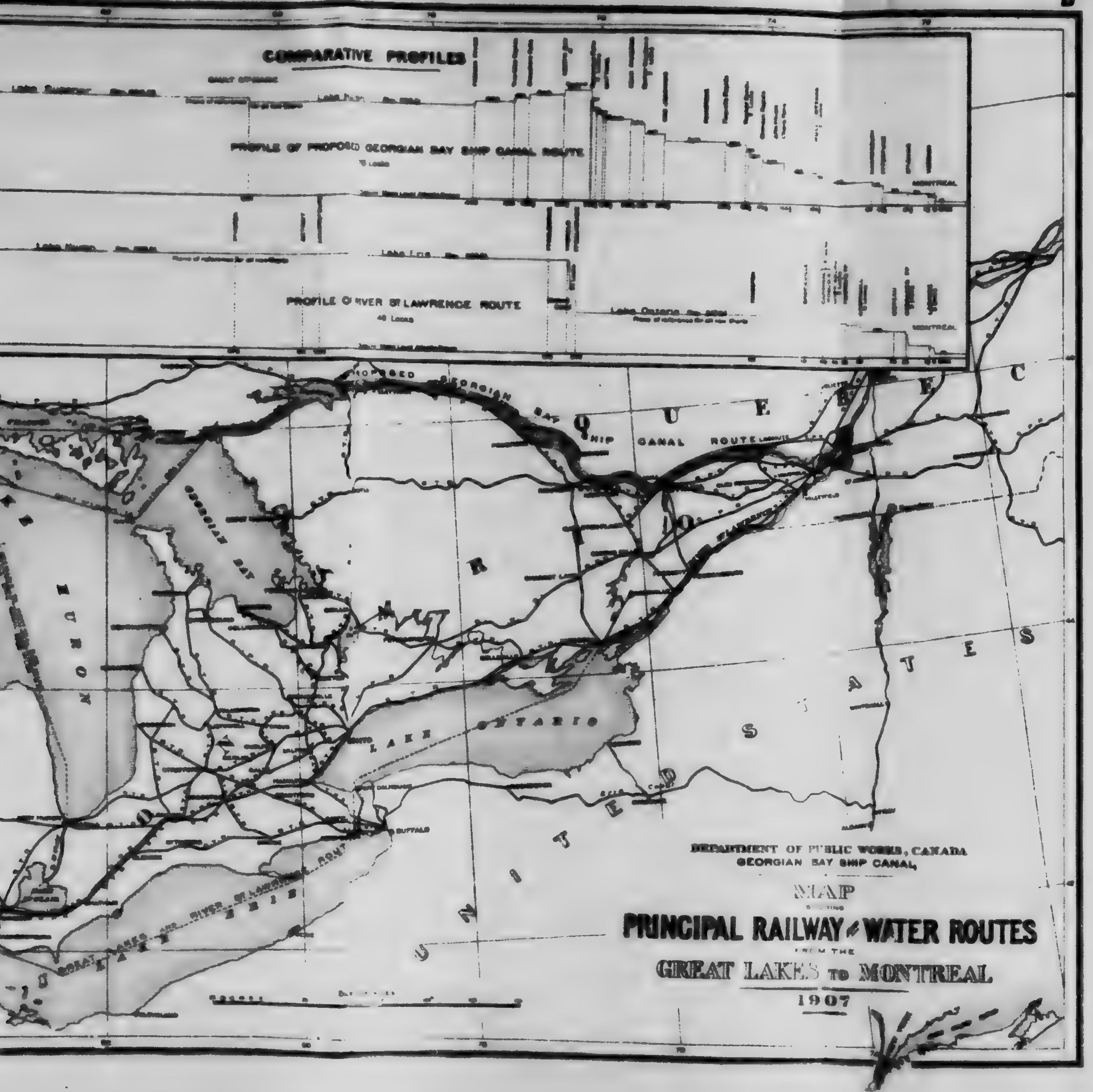
DEPARTMENT OF PUBLIC WORKS, CANADA

PROPOSED GEORGIAN BAY SHIP CANAL ROUTE


70
TIVE PROFILES
SED GEORGIAN BAY
20 Locks
Lake Erie
RIVER ST LAWRENC
40 Locks
PROPOSED
LAKE
SCALE OF MILES


ONTARIO
LAKE SUPERIOR
UNITED STATES
LAKE MICHIGAN
LAKE HURON

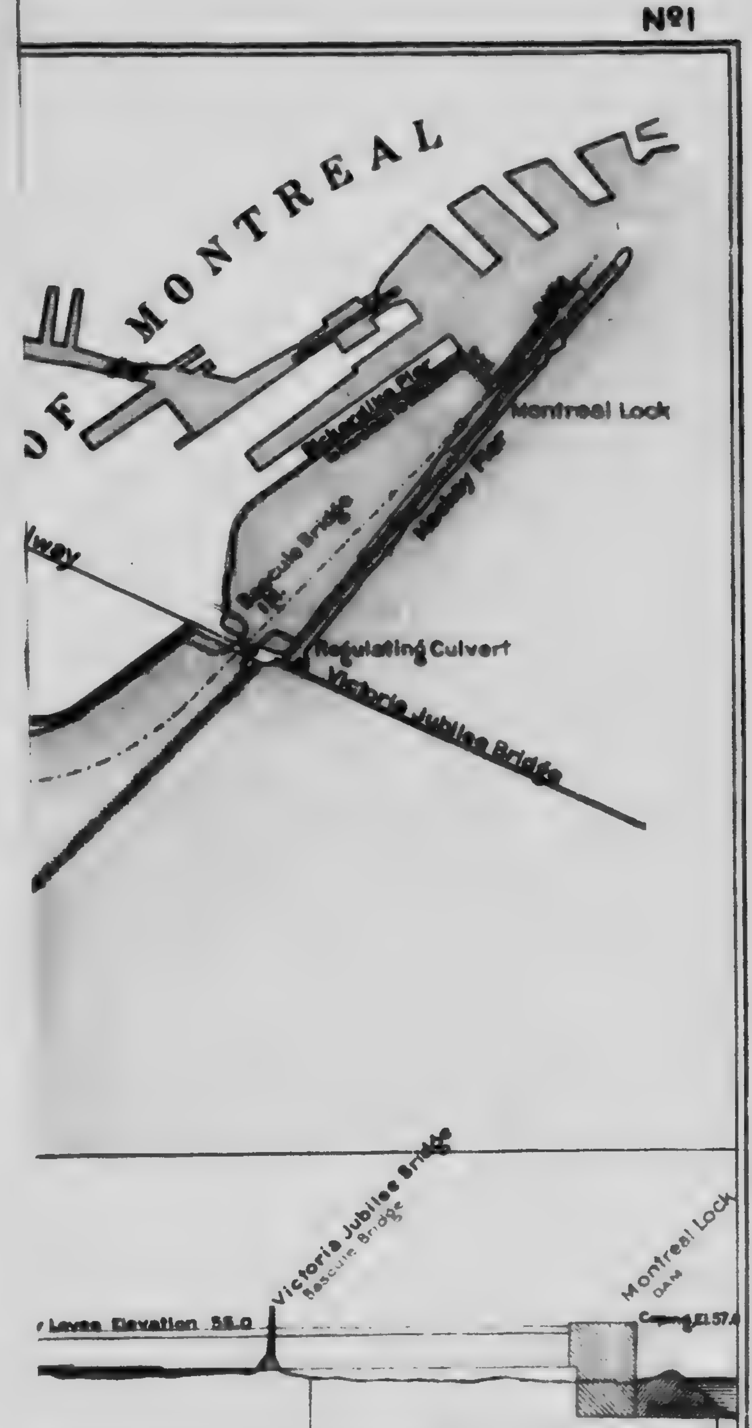
D



DEPARTMENT OF PUBLIC WORKS, CANADA
GEORGIAN BAY SHIP CANAL

MAP
SHOWING
PRINCIPAL RAILWAY & WATER ROUTES
FROM THE
GREAT LAKES TO MONTREAL
1907

Nº1

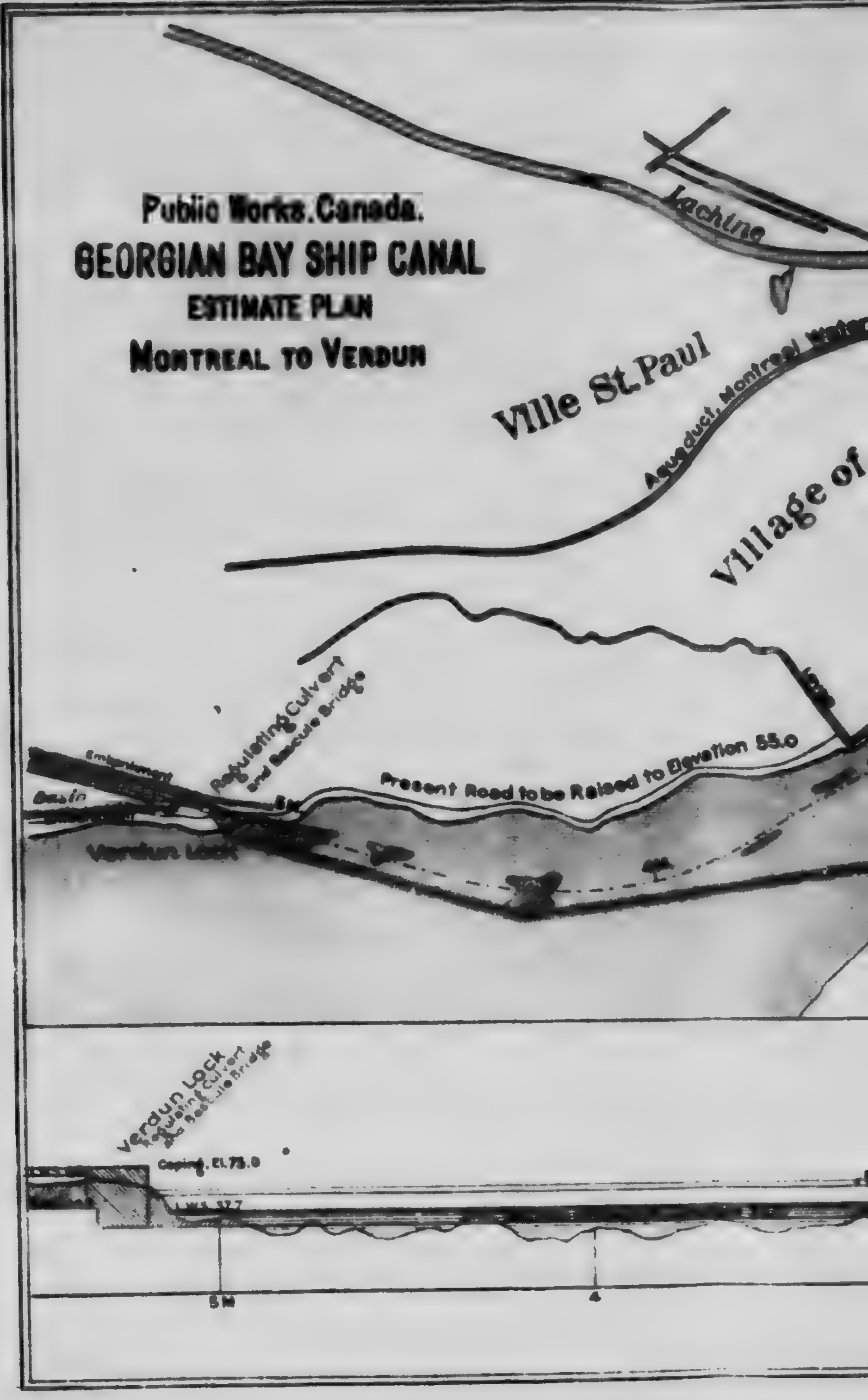

OF MONTREAL
Montreal Lock
Mackay Pier
Bascule Bridge
Rly way
Regulating Culvert
Victoria Jubilee Bridge
Levee Elevation 53.0
Victoria Jubilee Bridge
Bascule Bridge
Montreal Lock
DAM
Coping El.57.0
1
0M.
J.E.R. Matte, Del

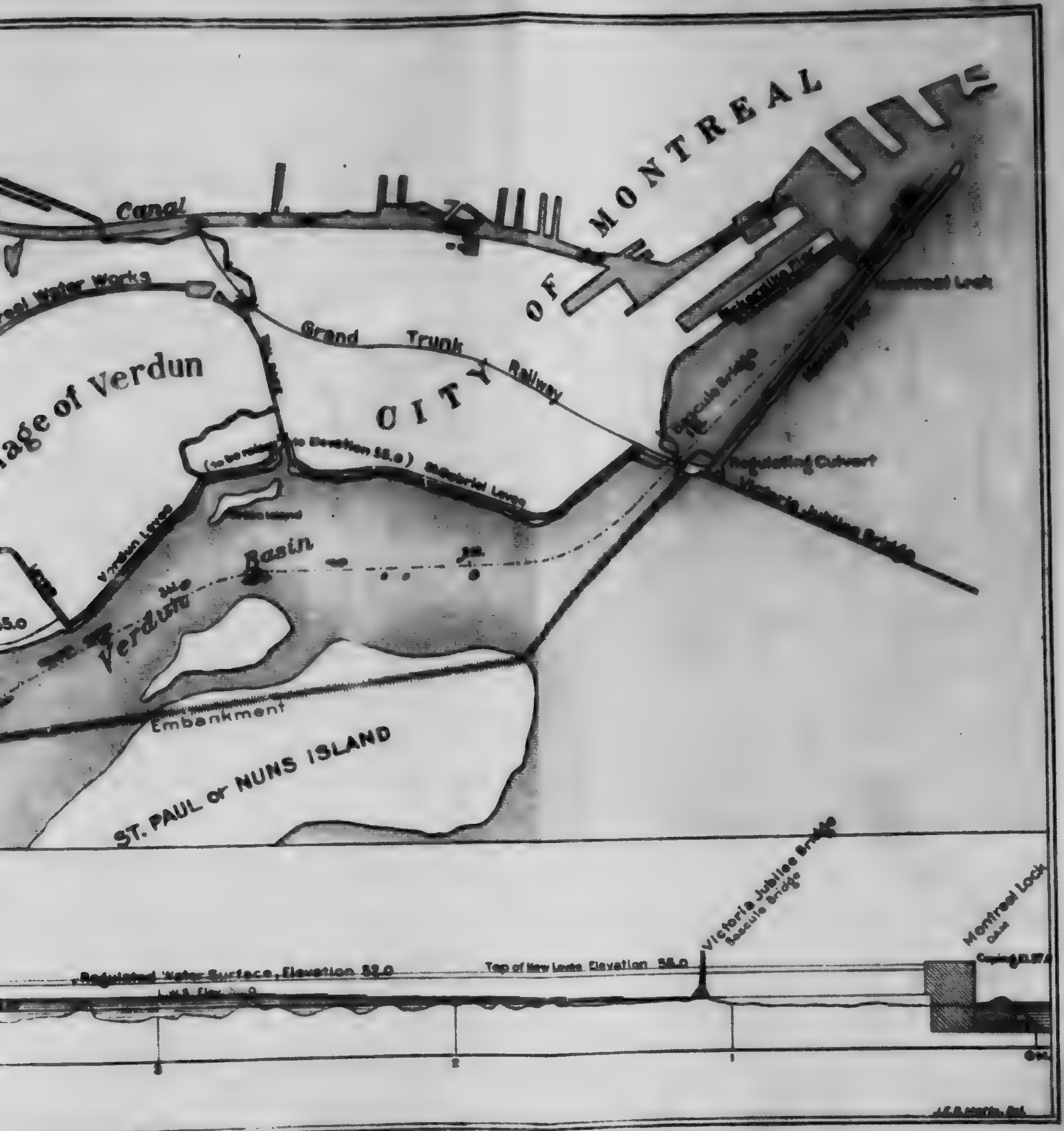
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

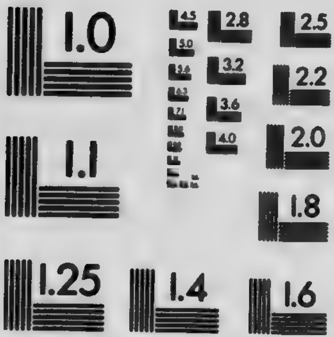
MONTREAL TO VERDUN


Lachine
Ville St.Paul
Aqueduct, Montreal
Village of
Regulating Culvert and Bascule Bridge
Embankment
Basin
Verdun Lock
Present Road to be Raised to Elevation 55.0
Verdun Lock Regulating Culvert and Bascule Bridge
Coping El.75.0
L.W.S. 37.7
5M
4


CITY OF MONTREAL
Canal
Water Works
Grand Trunk Railway
age of Verdun
CITY
Elevation 53.0
Levee
Verdun Levee
Basin
Verdun
Embankment
ST. PAUL or NUNS ISLAND
Montreal Lock
Mackay Pier
Bascule Bridge
Regulating Culvert
Victoria Jubilee Bridge
Regulated Water Surface, Elevation 52.0
Top of New Levee Elevation 58.0
Victoria Jubilee Bridge
Bascule Bridge
Montreal Lock
Coping
3
2
1

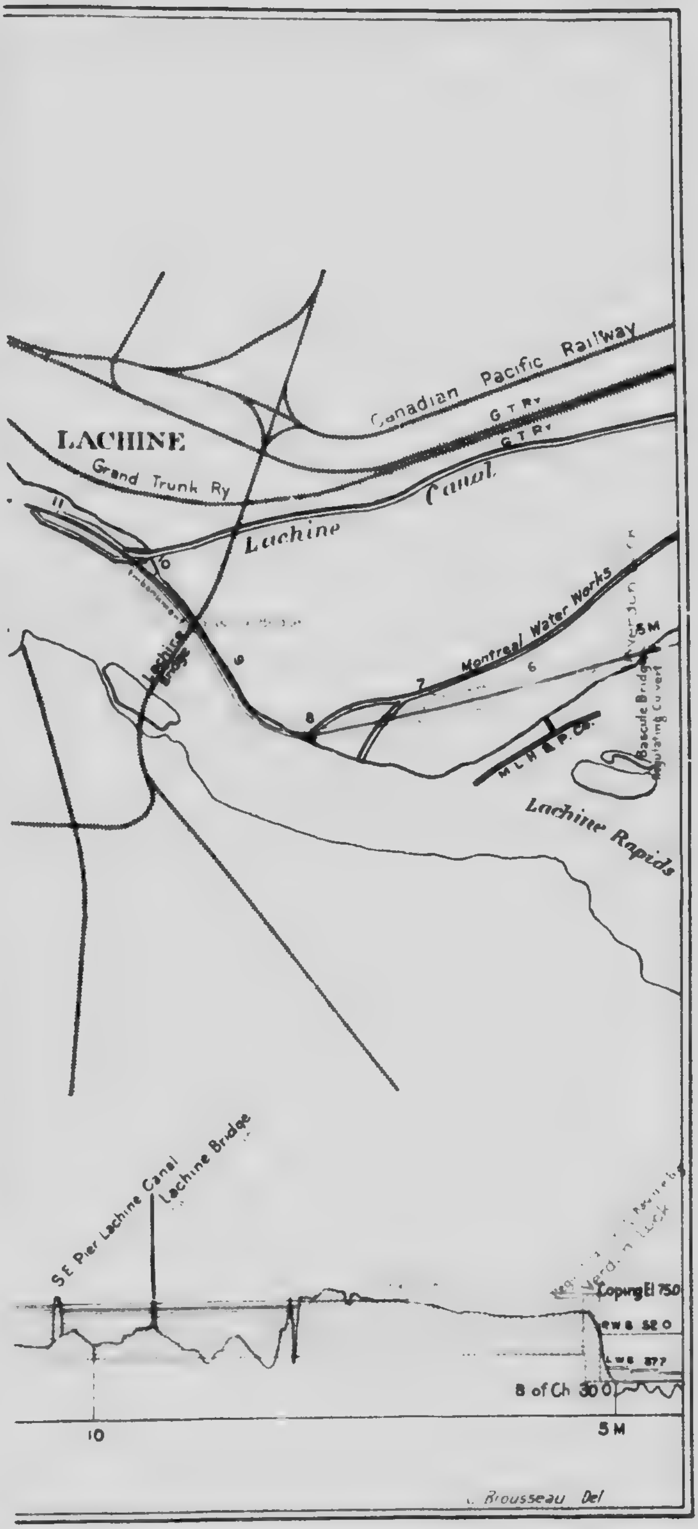
MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)

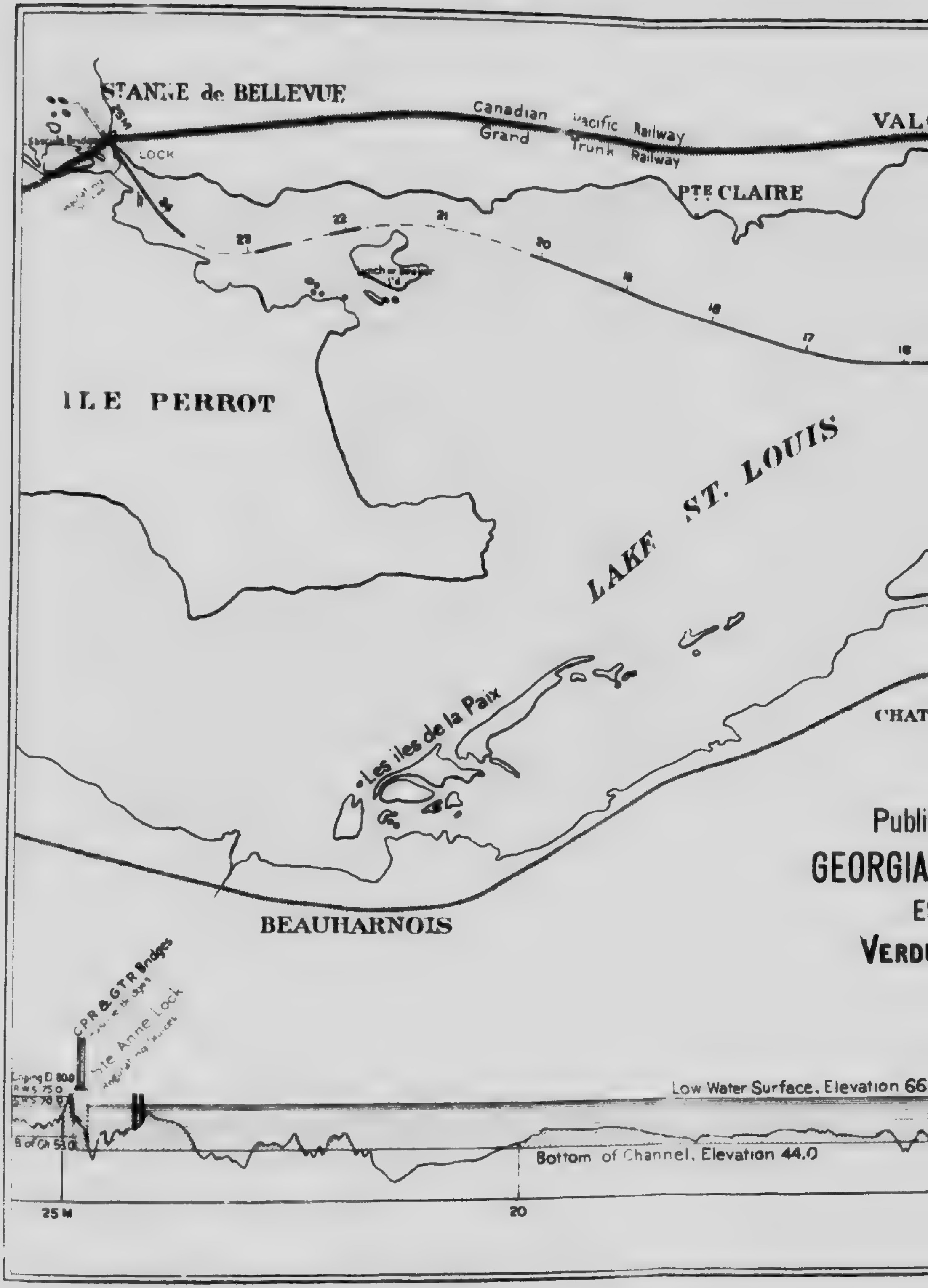


APPLIED IMAGE Inc
1653 East Main Street
Rochester, New York 14609 USA
(716) 482 – 0300 – Phone
(716) 288 – 5989 – Fax

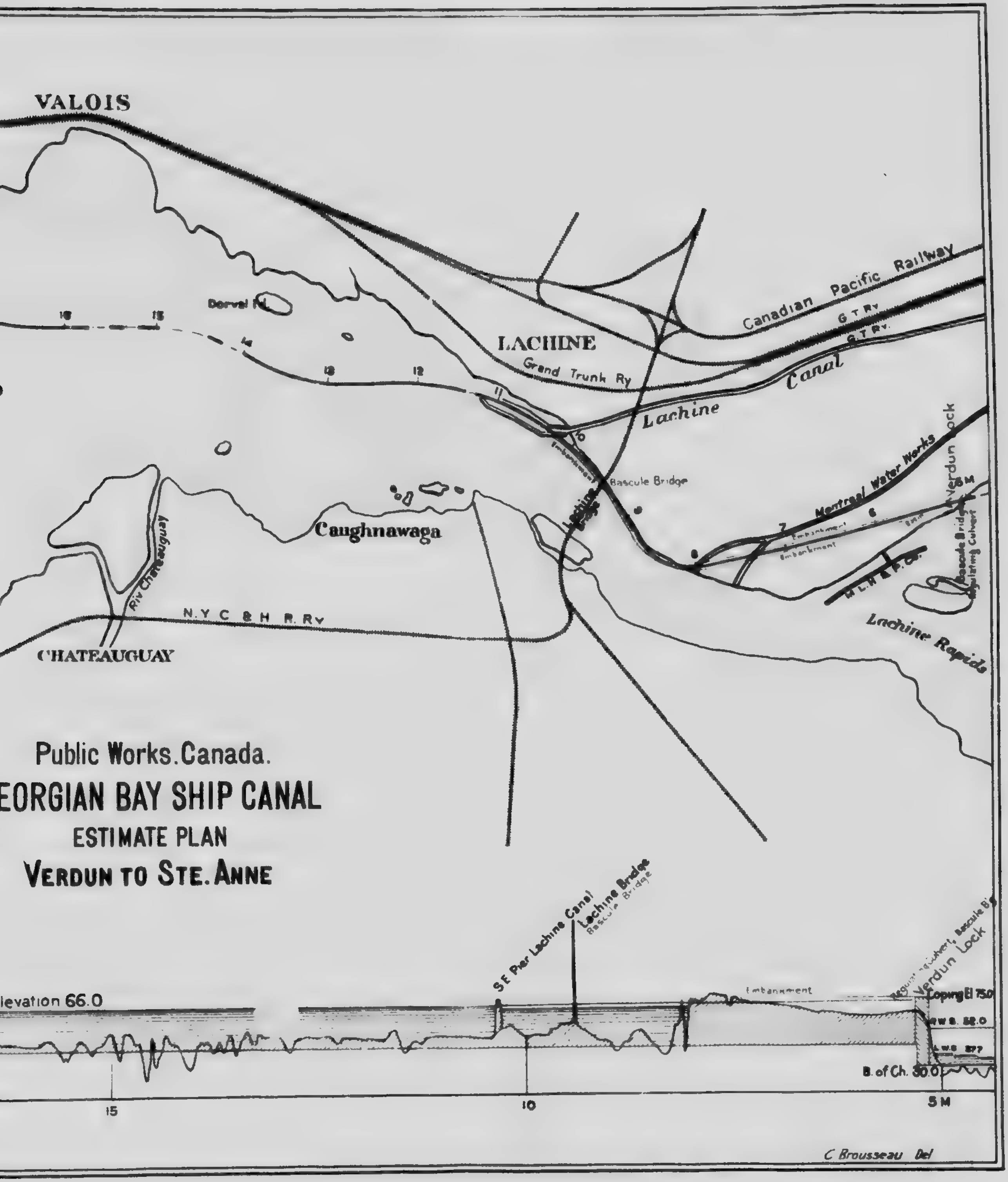
Nº2



Brousseau Del


STE ANNE de BELLEVUE
25 M
LOCK
Canadian Pacific Railway
Grand Trunk Railway
VAL
PTE CLAIRE
23
22
21
20
19
18
17
16
ILE PERROT
LAKE ST. LOUIS
Les iles de la Paix
CHAT
BEAUHARNOIS
Publi
GEORGIA
E
VERDU
CPR & GTR Bridges
Ste Anne Lock
Low Water Surface, Elevation 66
B of Ch 53.0
Bottom of Channel, Elevation 44.0
25 M
20

N°2



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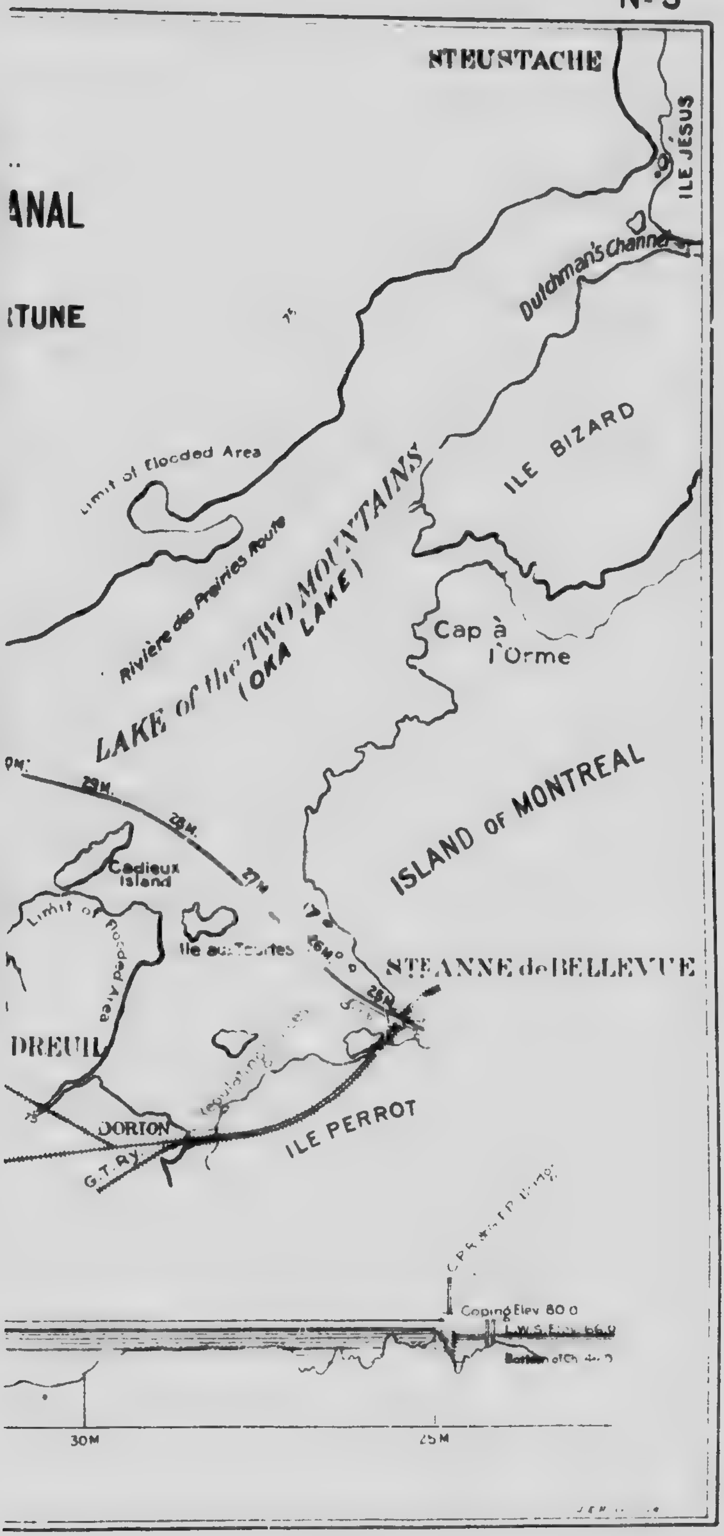
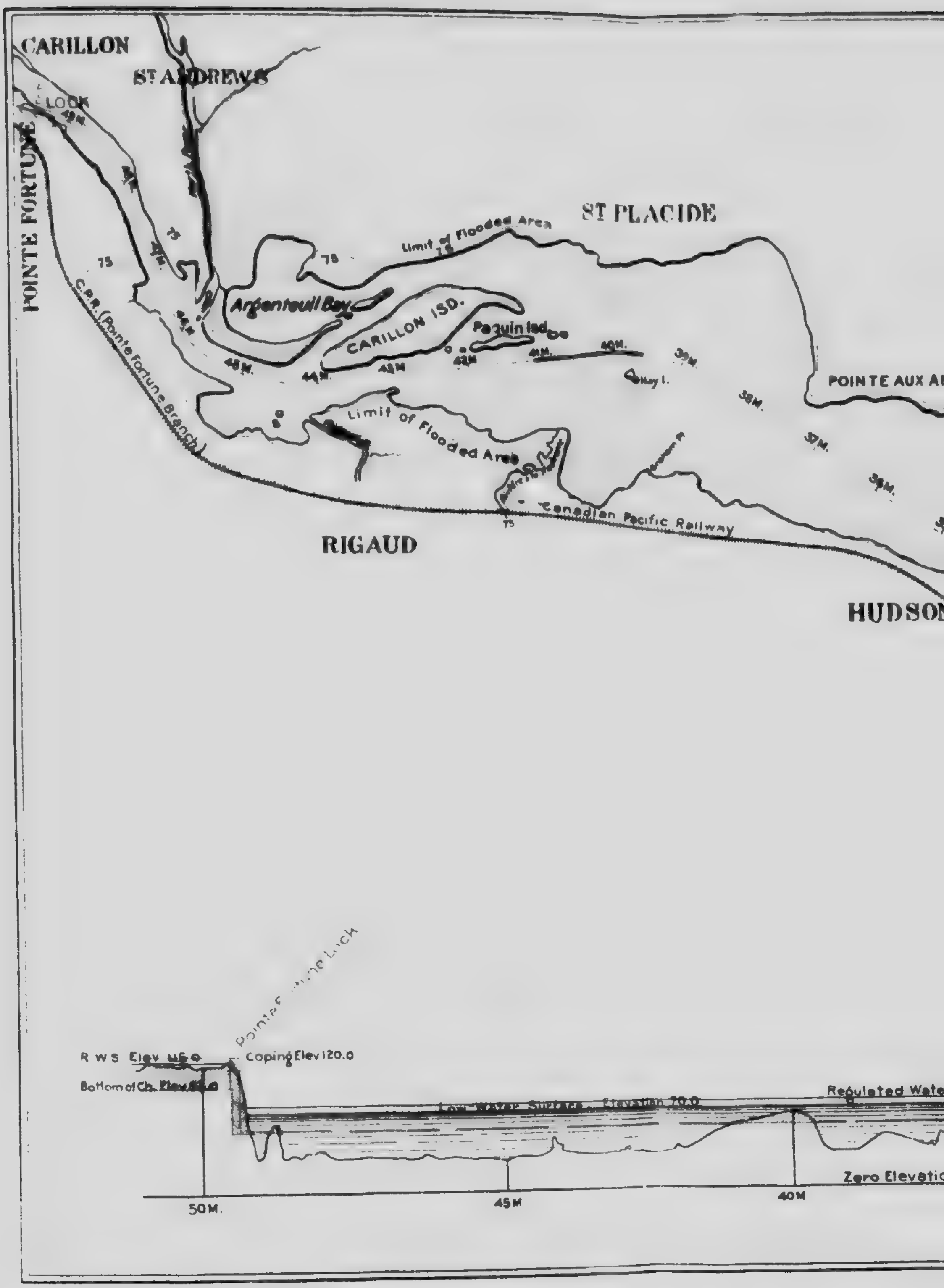
EORGIAN BAY SHIP CANAL

ESTIMATE PLAN

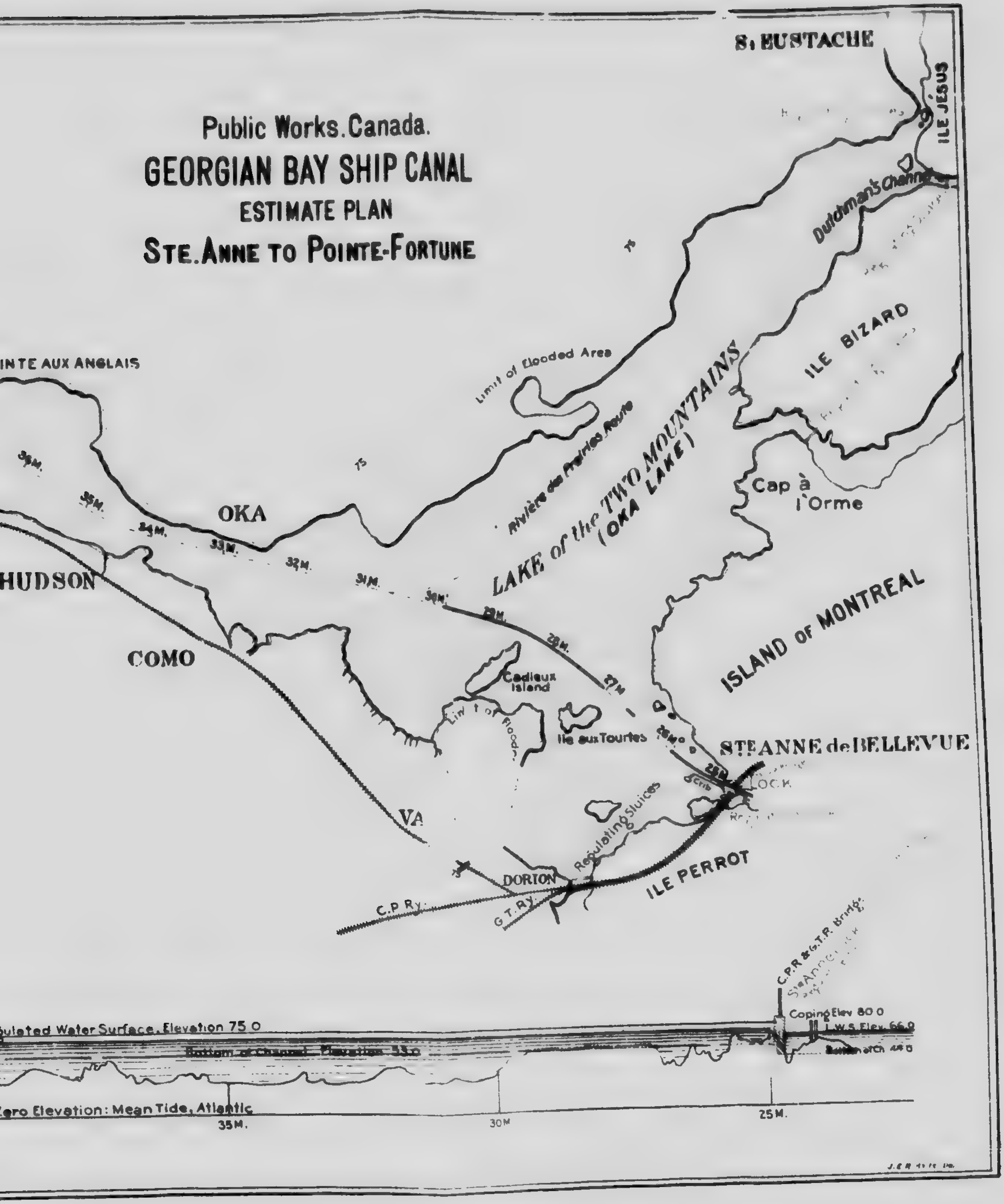
VERDUN TO STE. ANNE

Nº 3


ANAL
TUNE
STEUSTACHE
ILE JESUS
Dutchman's Channel
ILE BIZARD
Limit of Flooded Area
Rivière des Prairies Route
LAKE of the TWO MOUNTAINS
(OKA LAKE)
Cap à l'Orme
ISLAND of MONTREAL
29M.
28M.
27M.
26M.
25M.
Cadieux Island
Limit of Flooded Area
Ile aux Tourtes
STE ANNE de BELLEVUE
DREUIL
DORION
G.T.Ry.
ILE PERROT
C.P.R. & G.T.R. Bridge
Coping Elev 80.0
L.W.S. Elev. 66.0
Bottom of Ch. 44.0
30M
25M


CARILLON
ST ANDREWS
LOCK
POINTE FORTUNE
ST PLACIDE
Limit of Flooded Area
Argenteuil Bay
CARILLON ISD.
Paquin Isd
C.P.R. (Pointe Fortune Branch)
Limit of Flooded Area
Canadian Pacific Railway
RIGAUD
POINTE AUX A
HUDSON
75
49M.
48M.
44M.
42M.
41M.
40M.
39M.
38M.
37M.
36M.
R W S Elev 115.0
Bottom of Ch. Elev
Coping Elev 120.0
Low Water Surface Elevation 70.0
Regulated Wate
Zero Elevatio
50M.
45M
40M

№ 3



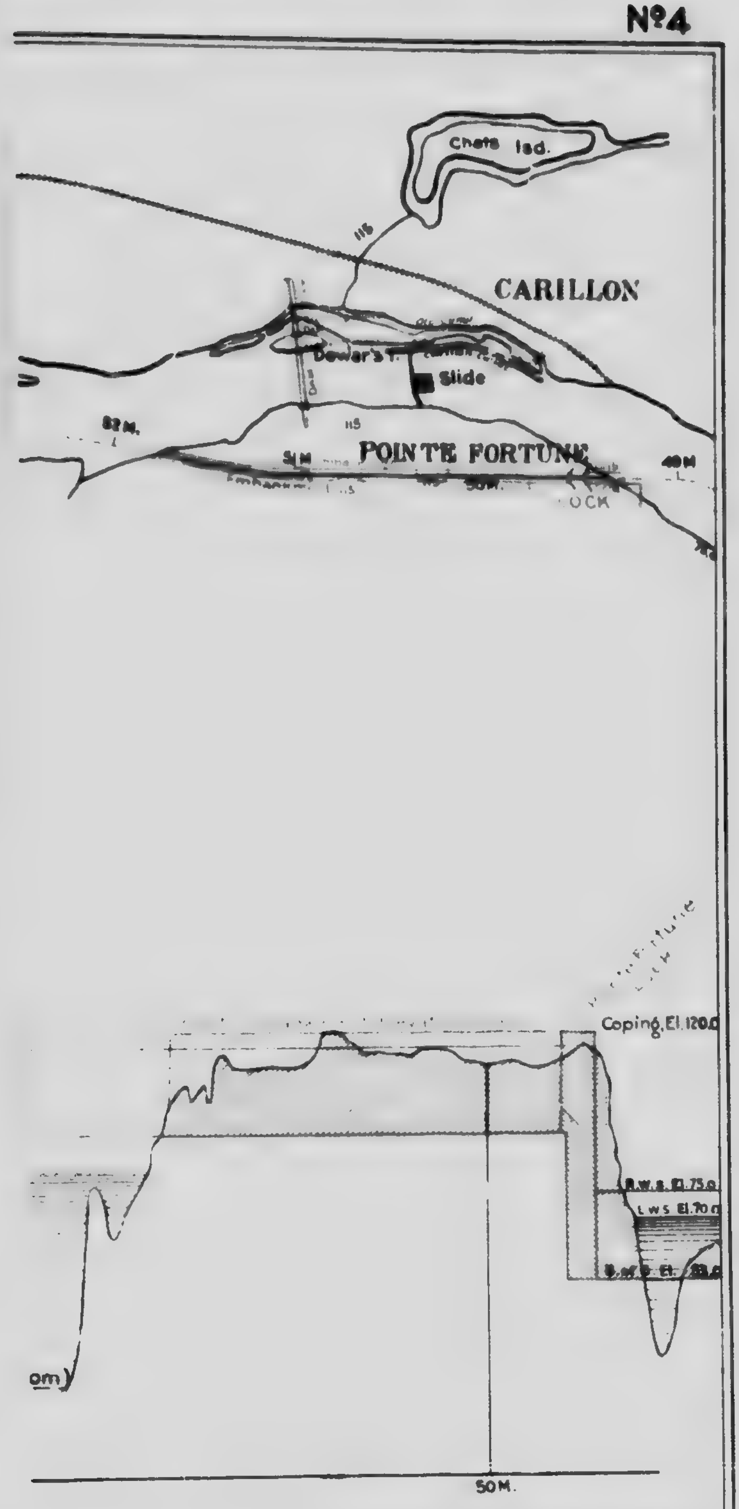
Public Works. Canada.

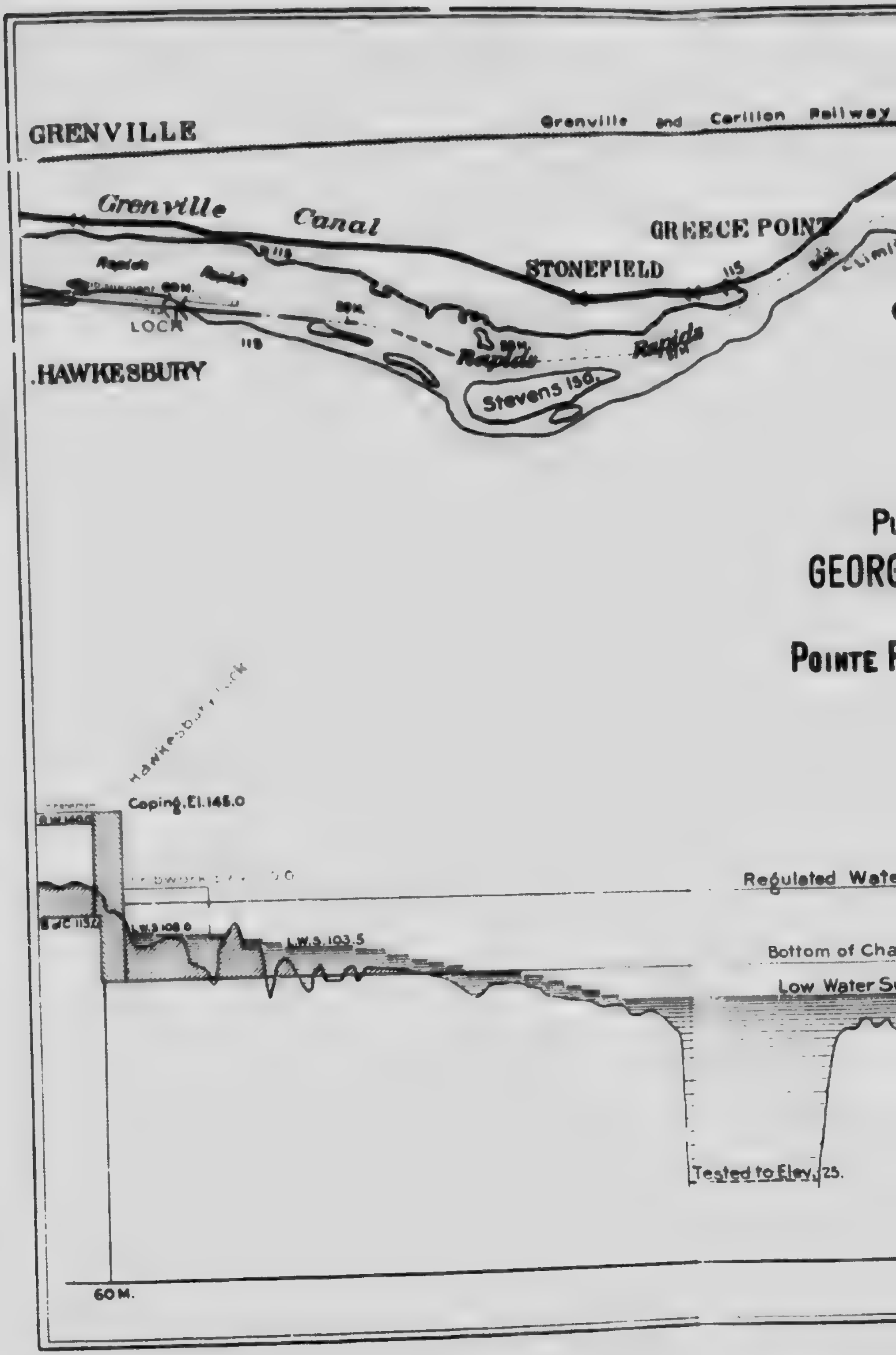
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

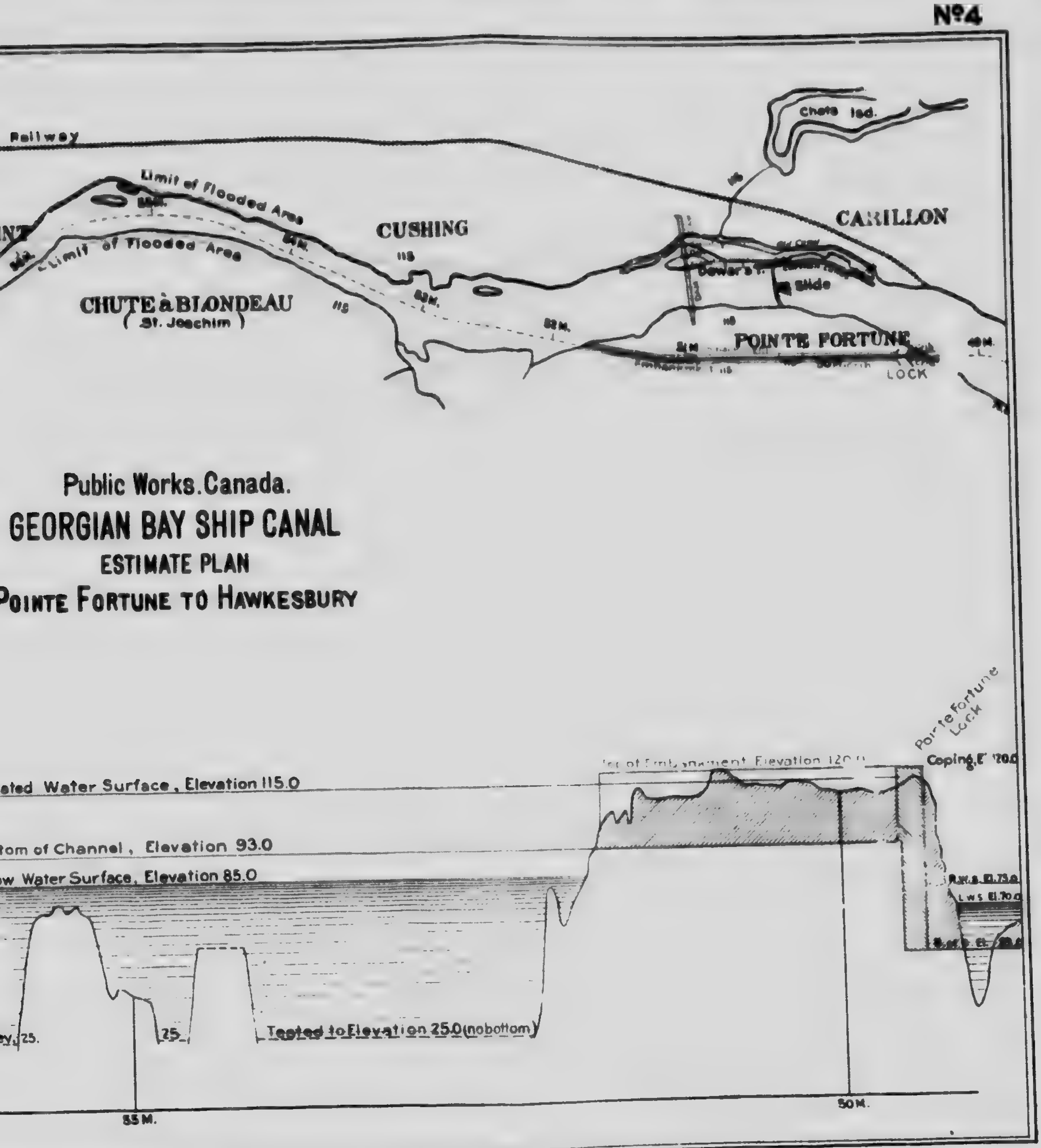
STE. ANNE TO POINTE-FORTUNE

Nº4


Chats Isd.
115
CARILLON
Dewar's I.
Slide
52 M.
115
POINTE FORTUNE
51 M
50 M.
40 M
LOCK
Coping. El. 120.0
H.W.S. El. 75.0
L.W.S. El. 70.0
El. 58.0
om)
50 M.


GRENVILLE
Grenville and Carillon Railway
Grenville Canal
GREECE POINT
STONEFIELD
Rapids
LOCK
HAWKESBURY
Stevens Isd.
115
Pu
GEORG
POINTE F
Hawkesbury Lock
Coping El. 145.0
Regulated Wate
Bottom of Cha
Low Water S
L.W.S. 103.5
L.W.S. 108.0
Tested to Elev. 25.
60 M.

Nº4



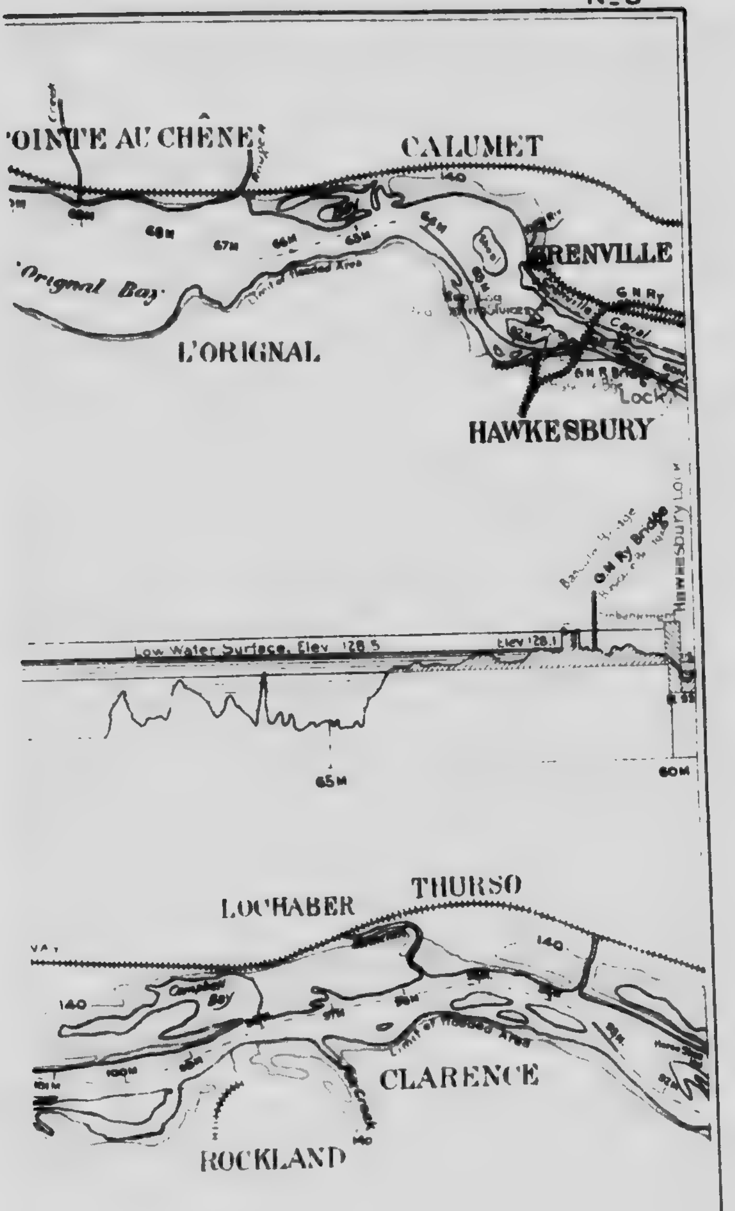
Public Works. Canada.

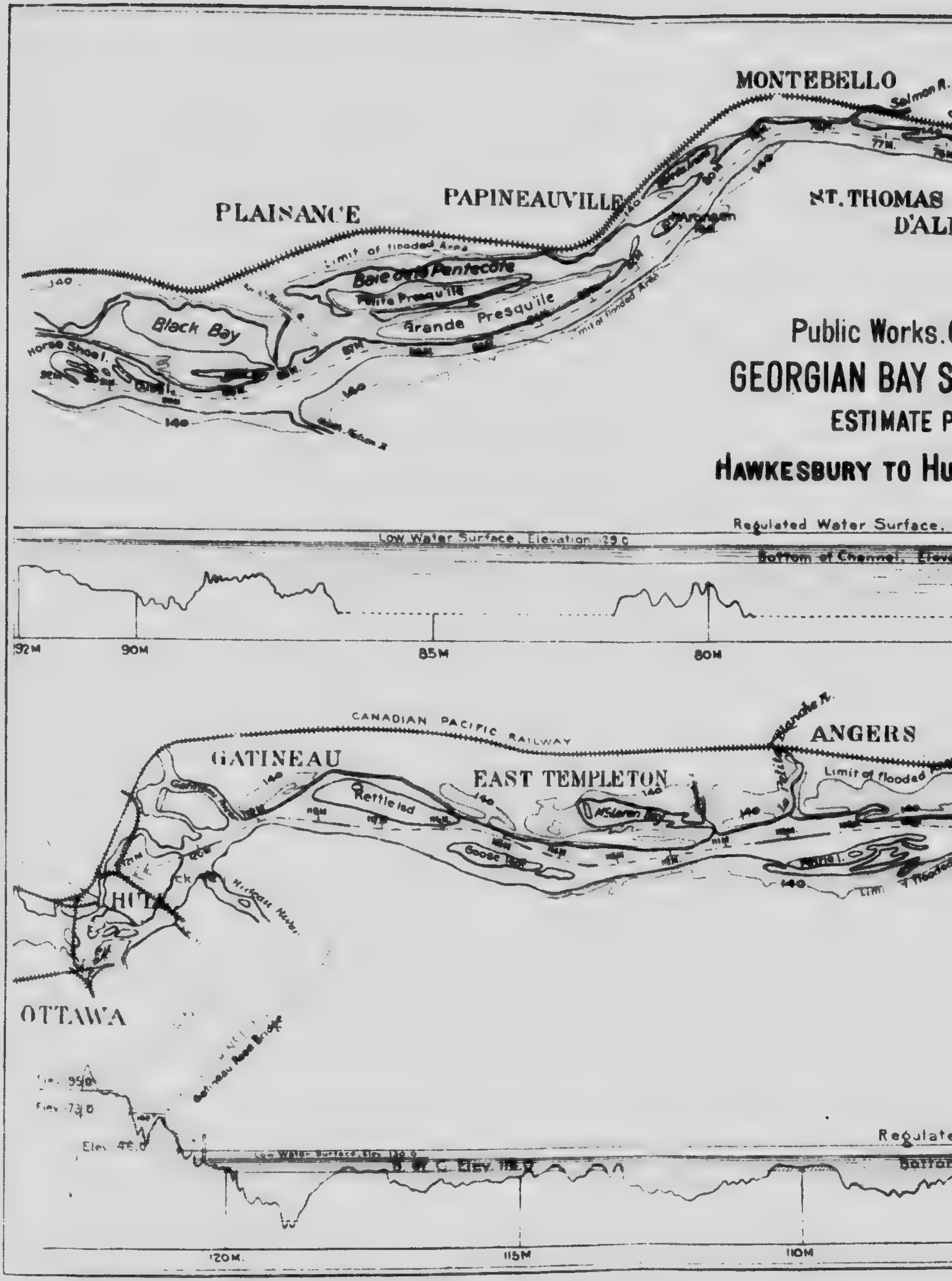
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

POINTE FORTUNE TO HAWKESBURY

No5


POINTE AU CHÊNE
CALUMET
140
69M
68M
67M
66M
65M
64M
'Orignal Bay
Limit of Flooded Area
GRENVILLE
G N Ry
Canal
Lock
L'ORIGNAL
HAWKESBURY
Low Water Surface, Elev 128.5
Elev 128.1
G.N Ry Bridge
Hawkesbury Lock
Embankment
65M
60M
LOCHABER
THURSO
140
Campbell Bay
100M
Limit of Flooded Area
CLARENCE
ROCKLAND
Creek
Surface, Elevation 125.0
B of C Elev 114.0
100M
95M
92M



MONTEBELLO
Salmon R.
PAPINEAUVILLE
PLAISANCE
ST. THOMAS
D'AL
Limit of flooded Area
Baie des Pentecote
Petite Presqu'ile
Grande Presqu'ile
Black Bay
Horse Shoe I.
140
Public Works, C
GEORGIAN BAY S
ESTIMATE P
HAWKESBURY TO HU
Regulated Water Surface.
Low Water Surface, Elevation 129.0
Bottom of Channel, Elev
92M
90M
85M
80M
CANADIAN PACIFIC RAILWAY
GATINEAU
EAST TEMPLETON
ANGERS
Blanche R.
Kettle Isd
Goose I.
McLaren Bay
Petite Blanche R.
Limit of flooded
HULL
OTTAWA
Gatineau Road Bridge
Elev. 95.0
Elev. 73.0
Elev. 48.0
Low Water Surface Elev. 130.0
B. of C. Elev. 118.0
Regulate
Bottom
120M.
115M
110M

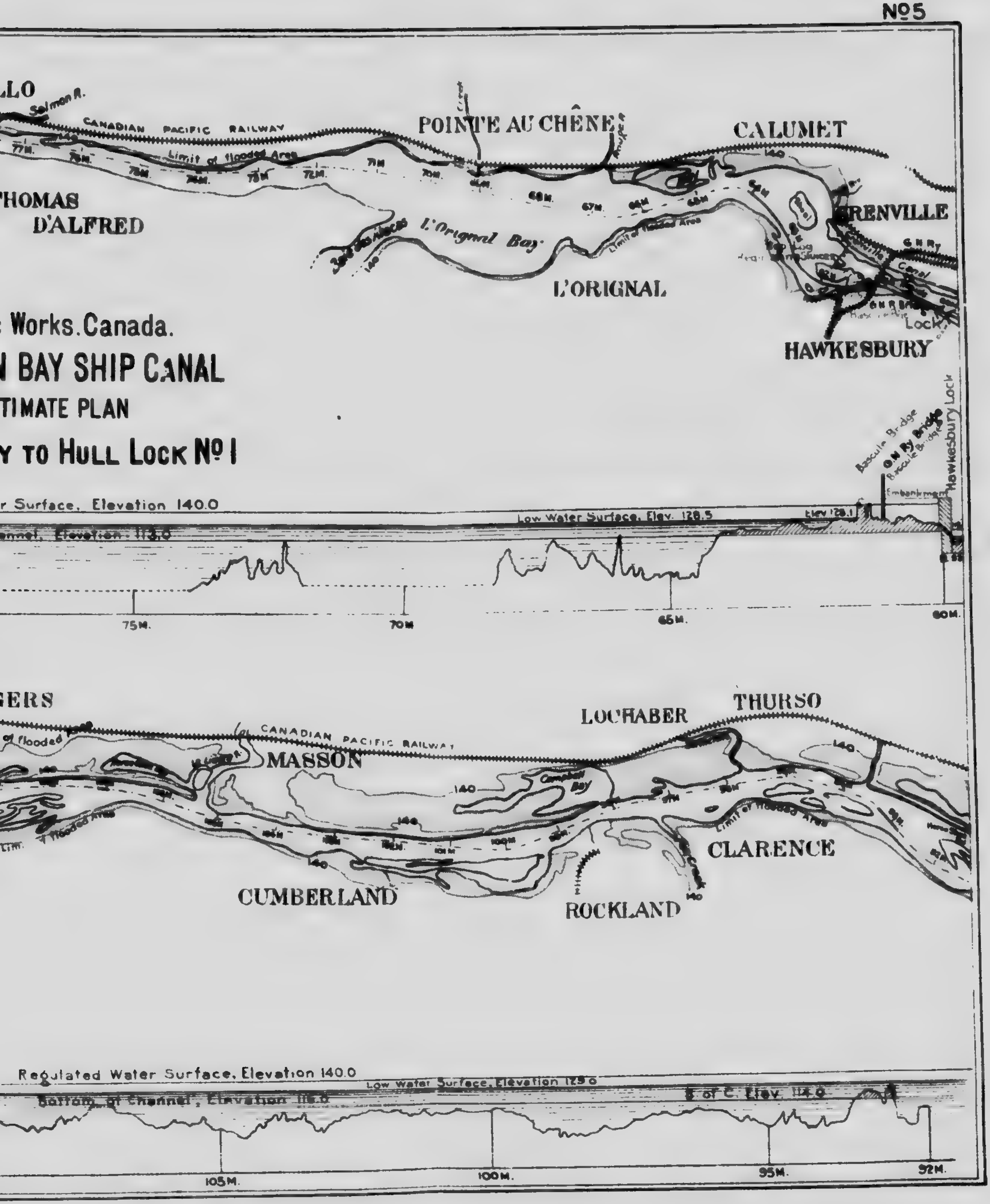
Nº5

Works. Canada.

N BAY SHIP CANAL

TIMATE PLAN

Y TO HULL LOCK Nº 1



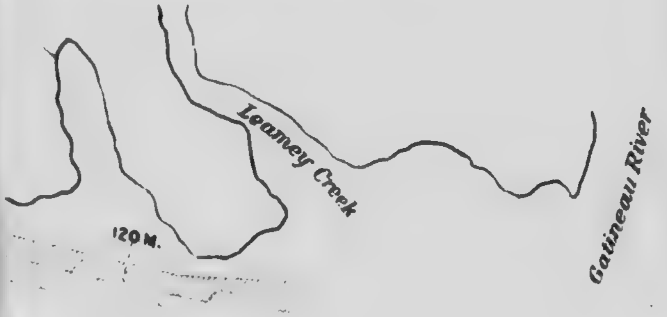
Nº6

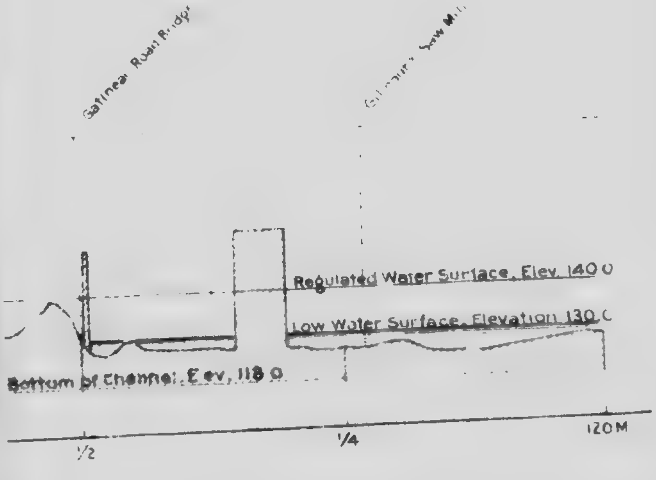
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

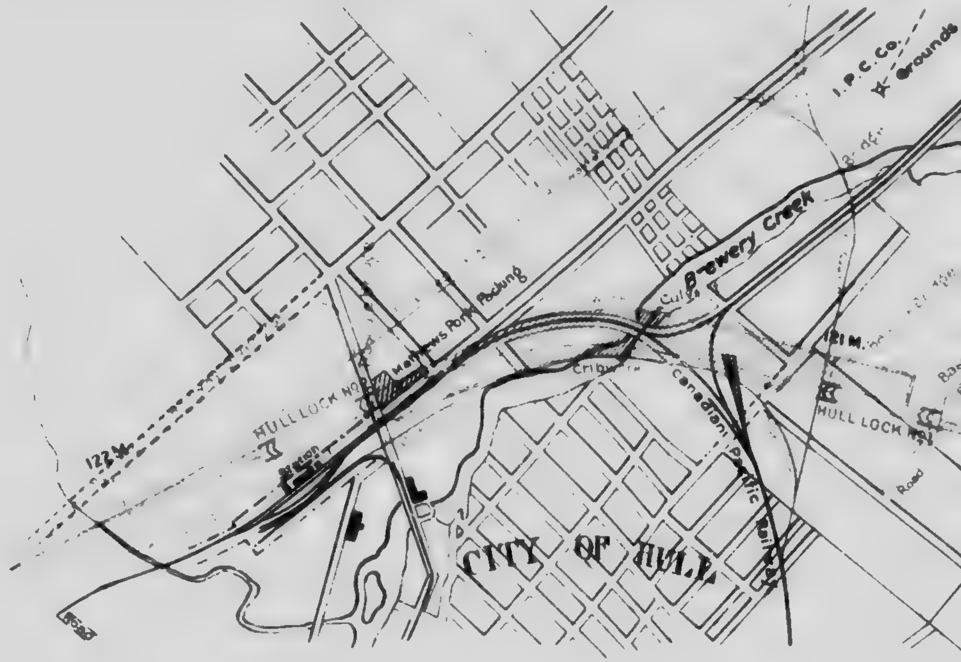
ESTIMATE PLAN

HULL LOCK Nº1 TO HULL LOCK Nº 2

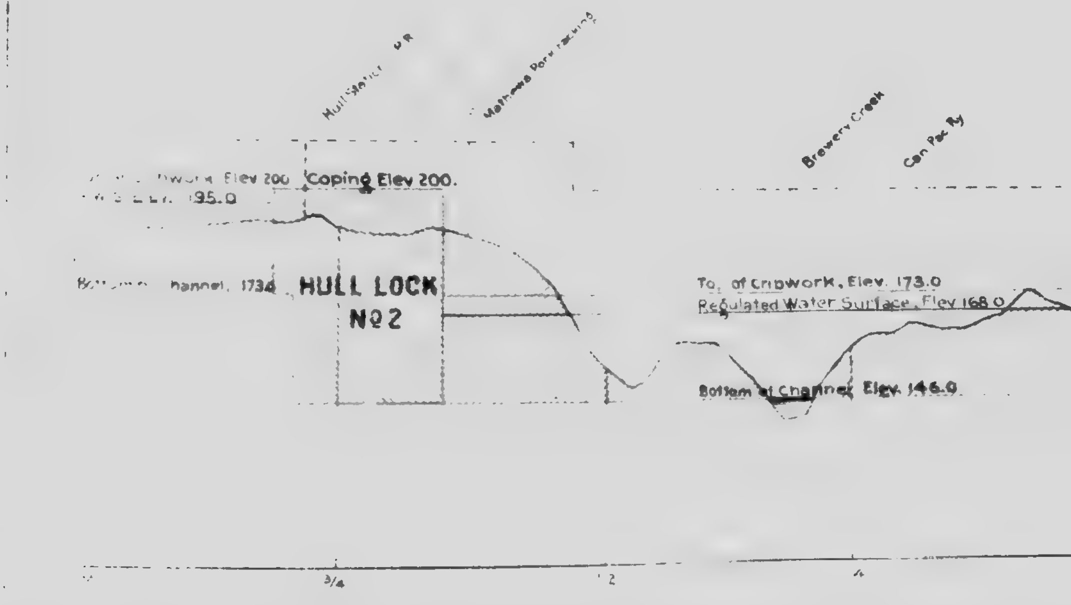



Gatineau Road Bridge
Gilmour's Saw Mill
Regulated Water Surface, Elev. 140.0
Low Water Surface, Elevation 130.0
Bottom of Channel, Elev. 118.0
1/2
1/4
120 M

E R Malte De



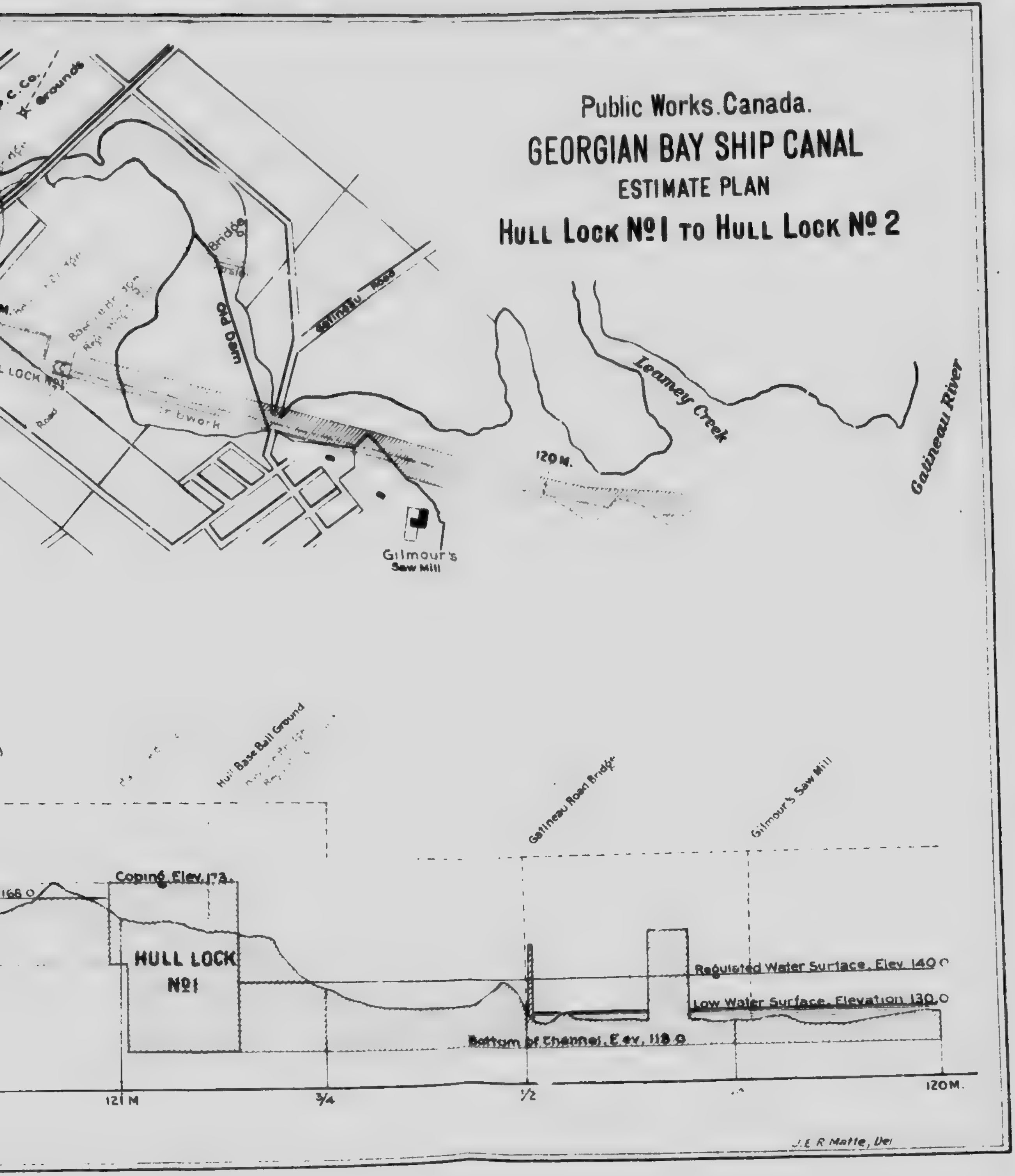
I.P.C.Co.
Grounds
Brewery Creek
Culvert
Mathews Pork Packing
HULL LOCK NO 2
Station
122 M.
121 M.
Cribwork
Canadian Pacific Railway
HULL LOCK NO 3
Road
CITY OF HULL



Hull Station
Mathews Pork Packing
Brewery Creek
Can Pac Ry
Cribwork Elev 200
Coping Elev 200.
Elev. 195.0
Bottom of Channel 173.4
HULL LOCK
NO 2
Top of Cribwork, Elev. 173.0
Regulated Water Surface, Elev 168.0
Bottom of Channel Elev. 146.0
3/4
2

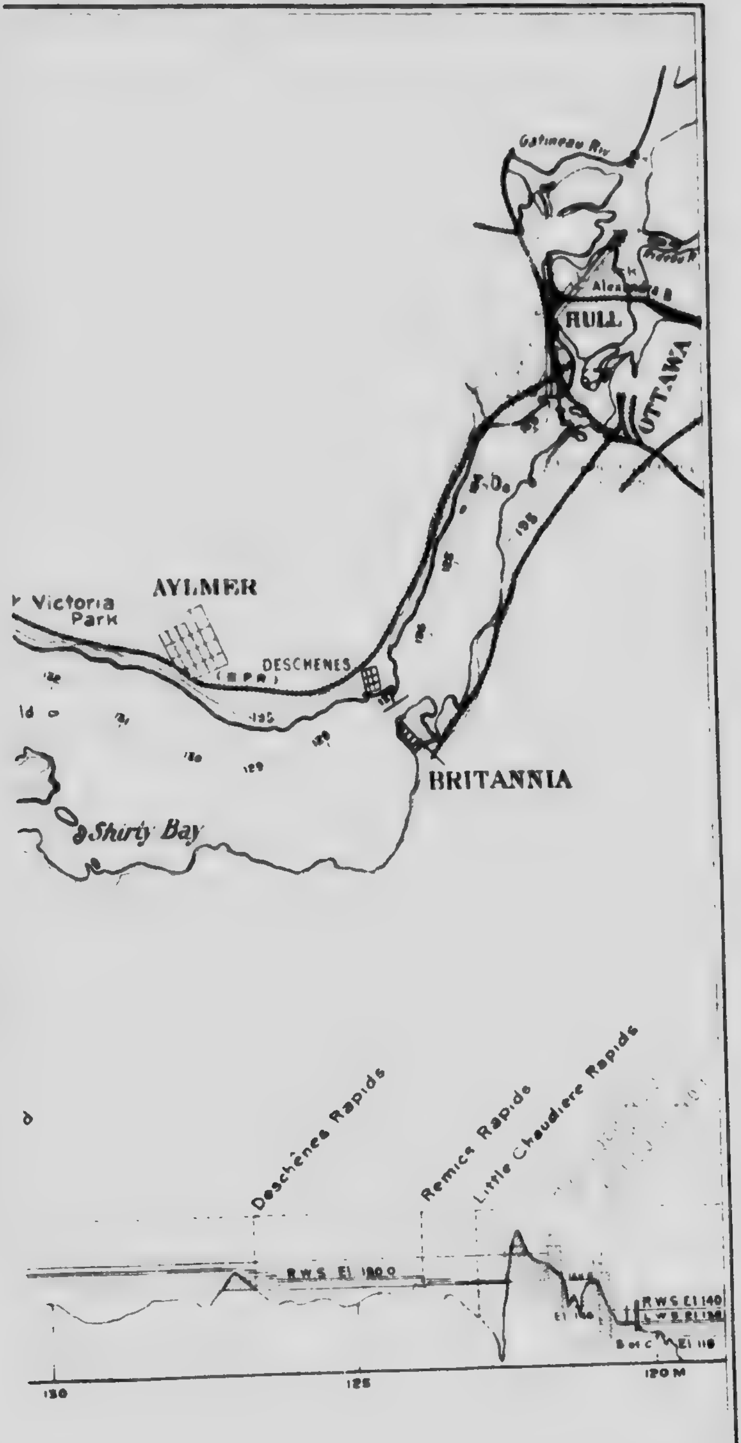
Nº6

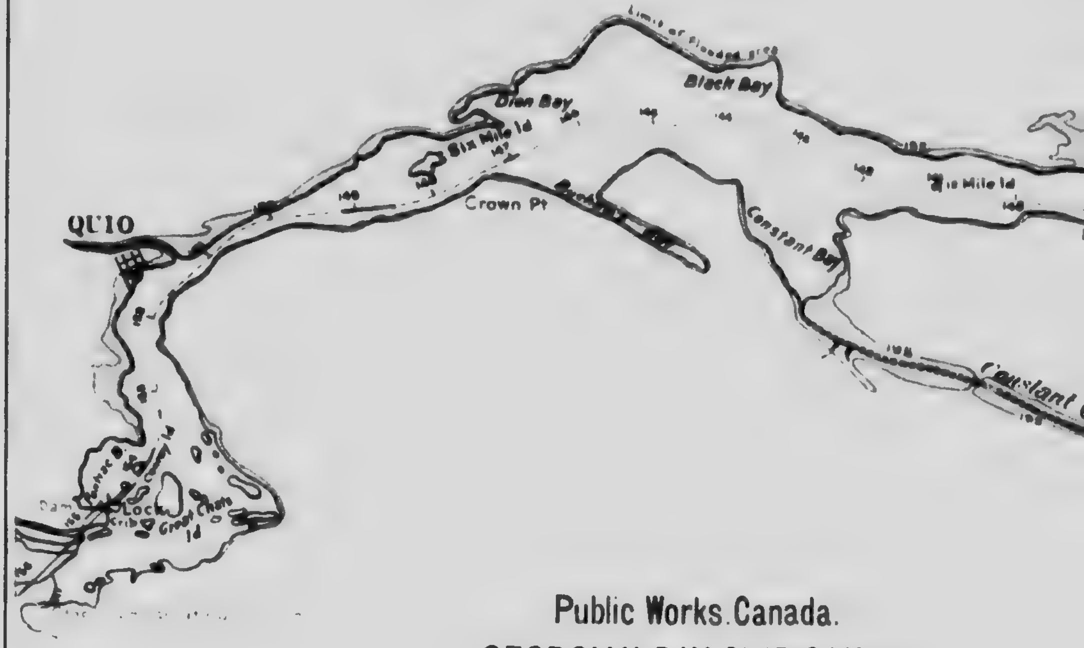
Public Works. Canada.
GEORGIAN BAY SHIP CANAL
ESTIMATE PLAN
Hull Lock Nº1 to Hull Lock Nº 2



J.E.R. Matte, Del.

Nº 7


Gatineau Riv
Alexandra B
HULL
OTTAWA
AYLMER
Victoria Park
DESCHENES
(E.P.R.)
BRITANNIA
Shirly Bay
135
129
130
Deschênes Rapids
Remics Rapids
Little Chaudiere Rapids
R.W.S. El. 180.0
R.W.S. El. 140
L.W.S. El. 136
El. 160
Bot. C. El. 118
130
125
120 M

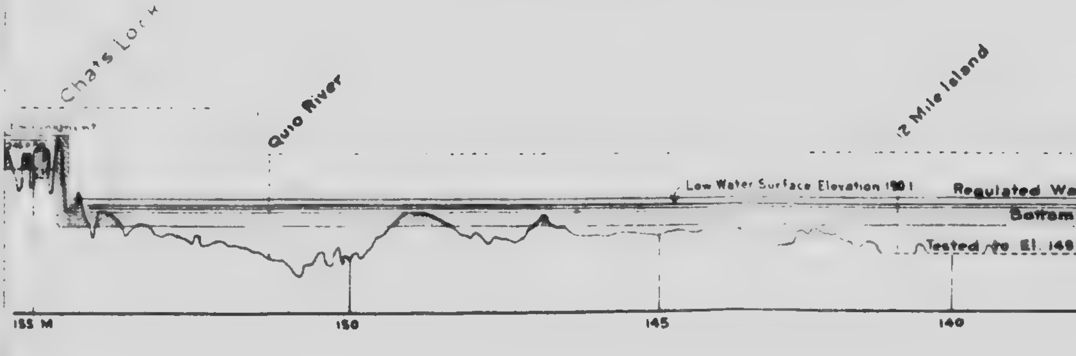


Public Works Canada.

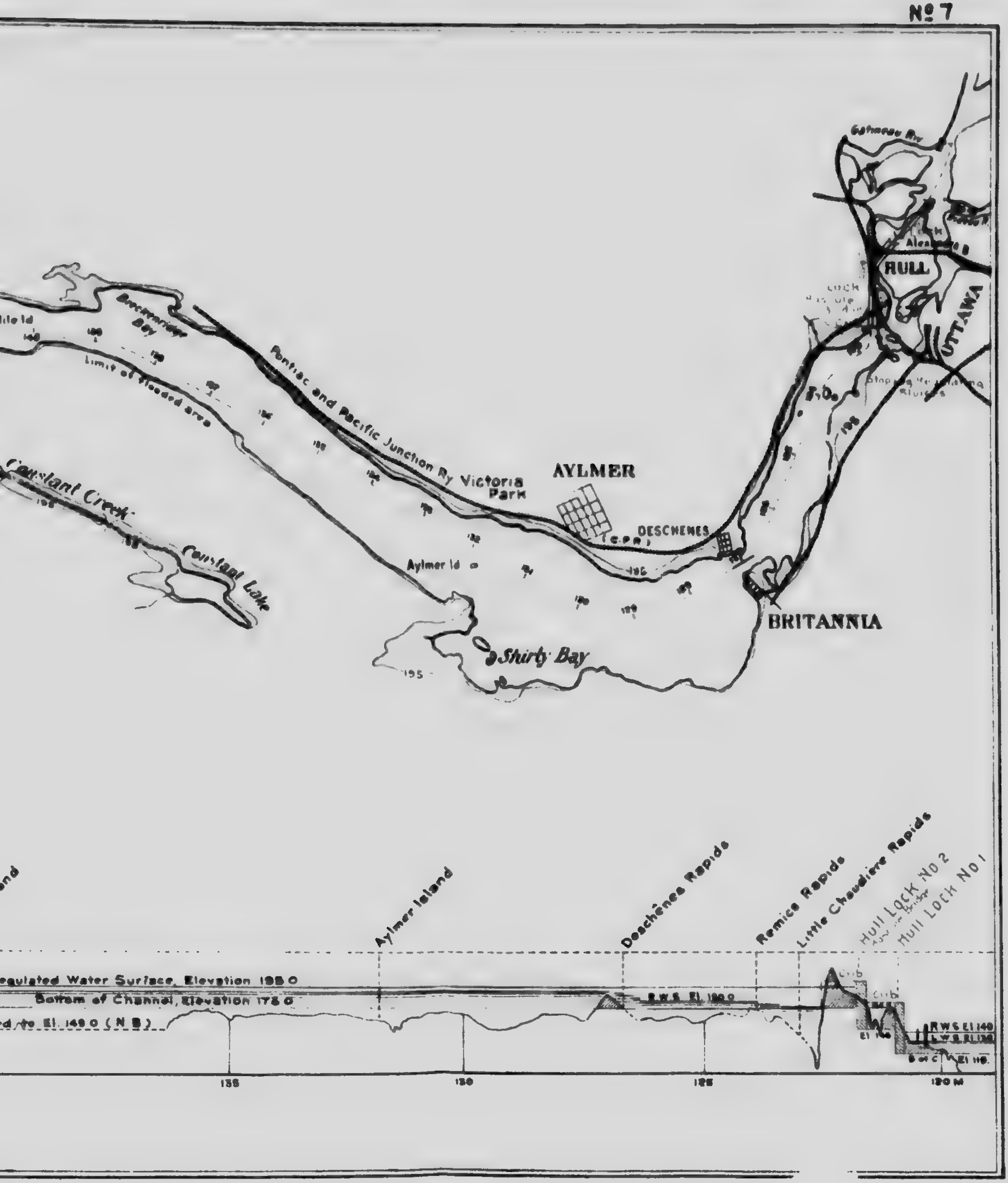
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

HULL LOCK No 2 TO CHATS LOCK

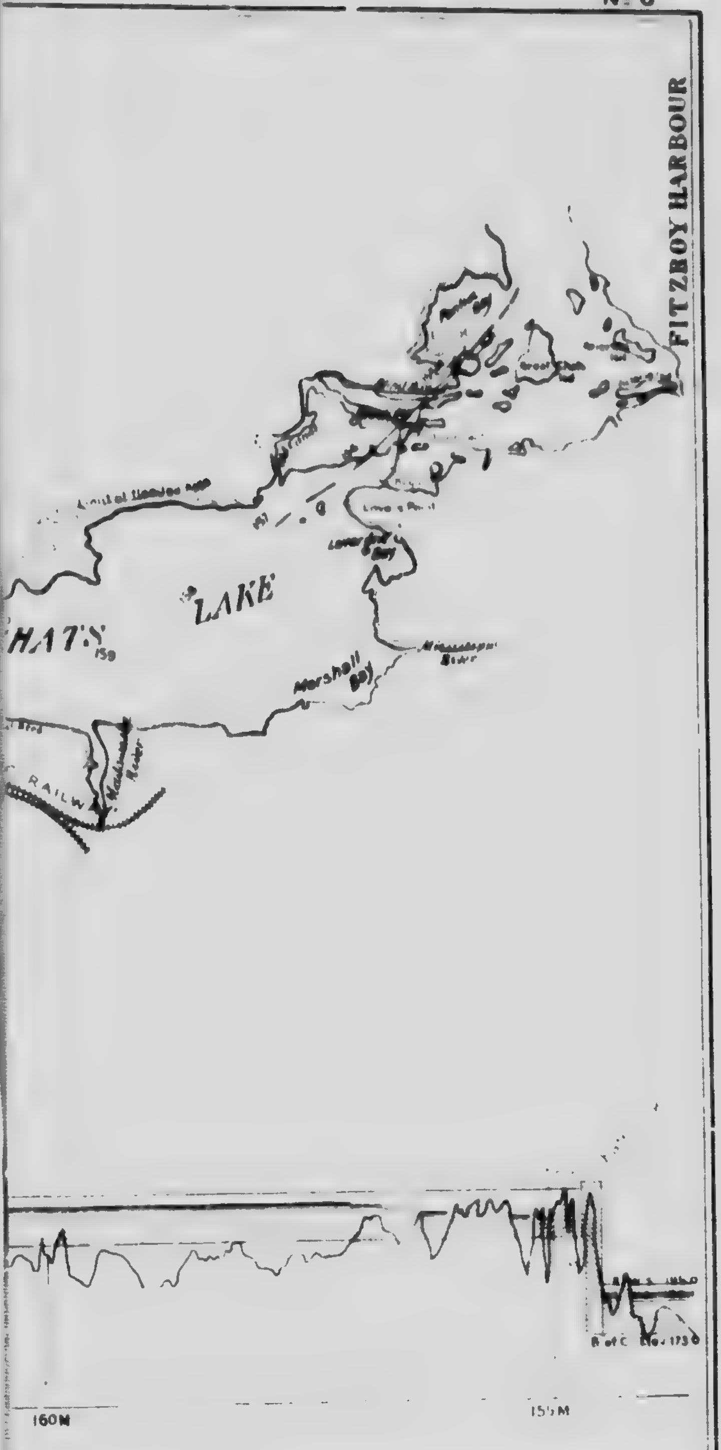


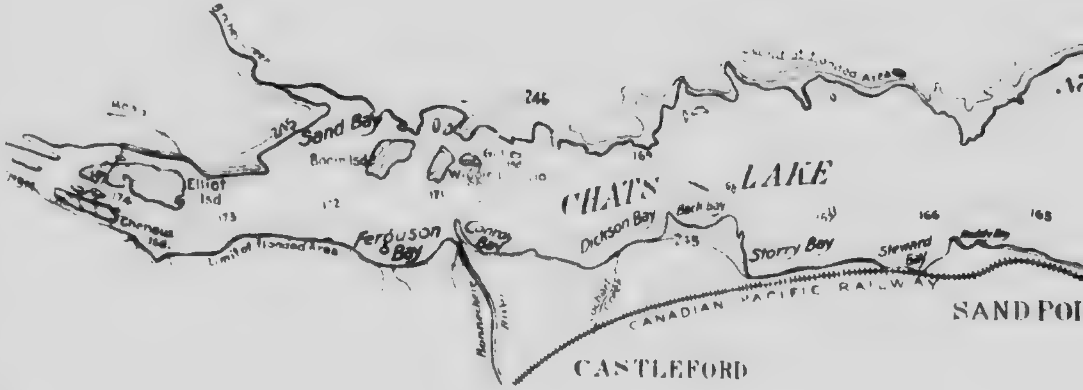
Nº 7


Gatineau Riv
Alexandra B
HULL
Lock
OTTAWA
Stopping Regulating Sluices
195
Breckenridge Bay
Mile Id
Pontiac and Pacific Junction Ry
Victoria Park
Limit of flooded area
AYLMER
DESCHENES
(C.P.R.)
Aylmer Id
BRITANNIA
Constant Creek
Constant Lake
Shirly Bay
195
Aylmer Island
Deschênes Rapids
Remics Rapids
Little Chaudiere Rapids
Hull Lock No 2
Hull Lock No 1
Crib
R.W.S. El. 190.0
R.W.S. El 140
L.W.S. El 136
El 146
B of C
El 118
Regulated Water Surface, Elevation 195.0
Bottom of Channel, Elevation 175.0
d to El. 149.0 (N.B.)
135
130
125
120 M

Nº 8

FITZROY HARBOUR



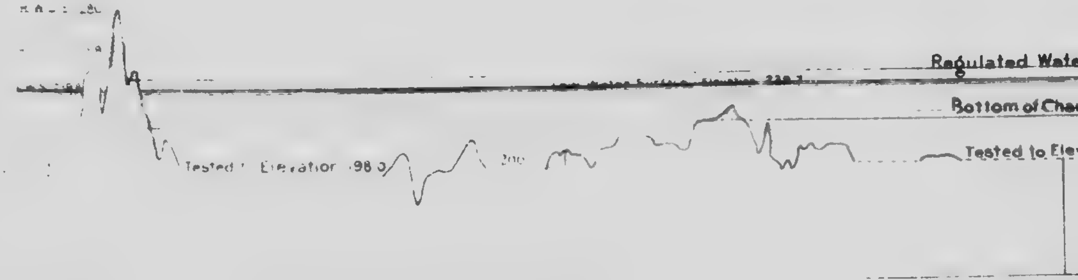


Public Works. Canada.

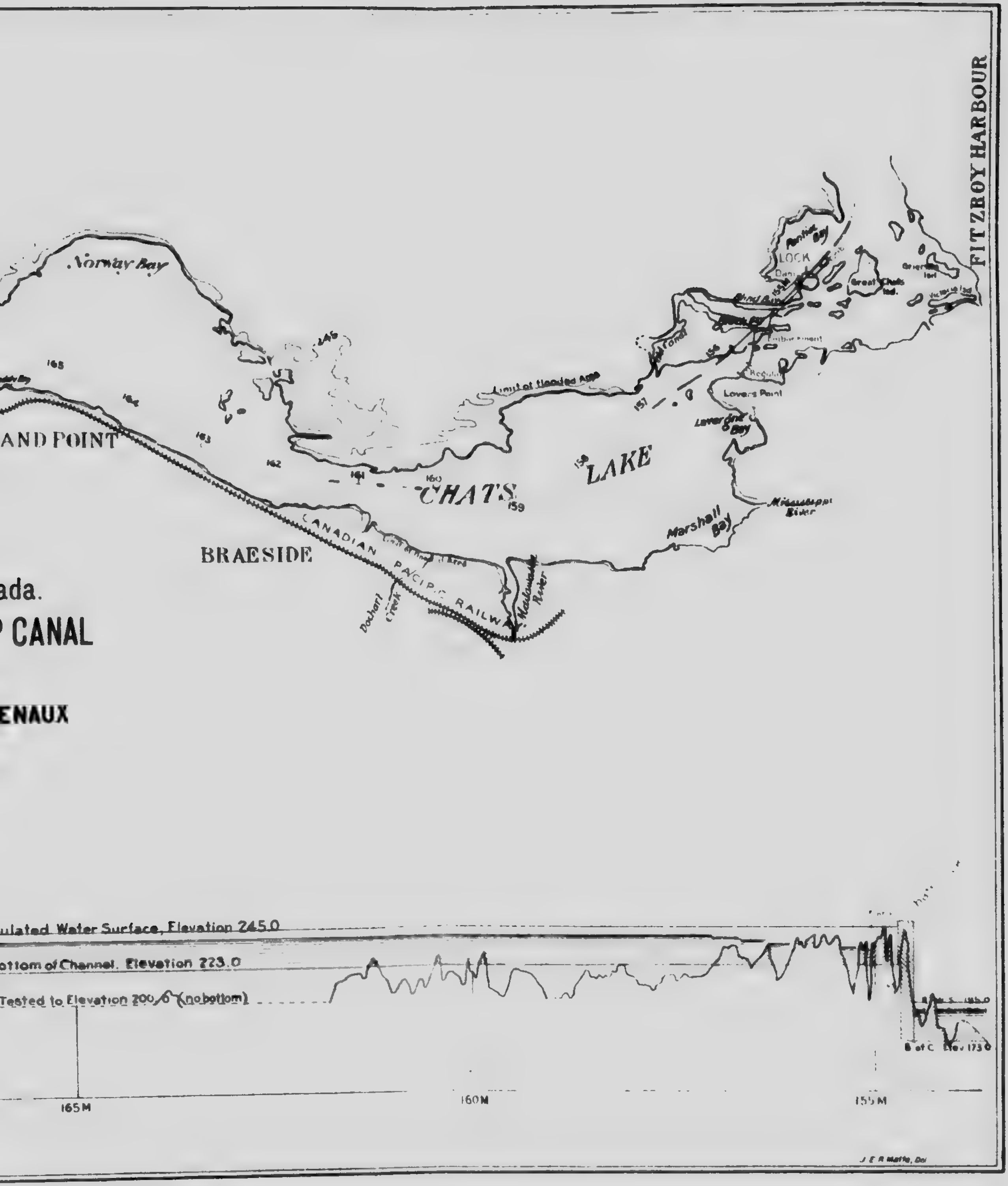
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

CHATS LOCK TO CHENAUX



Nº 8

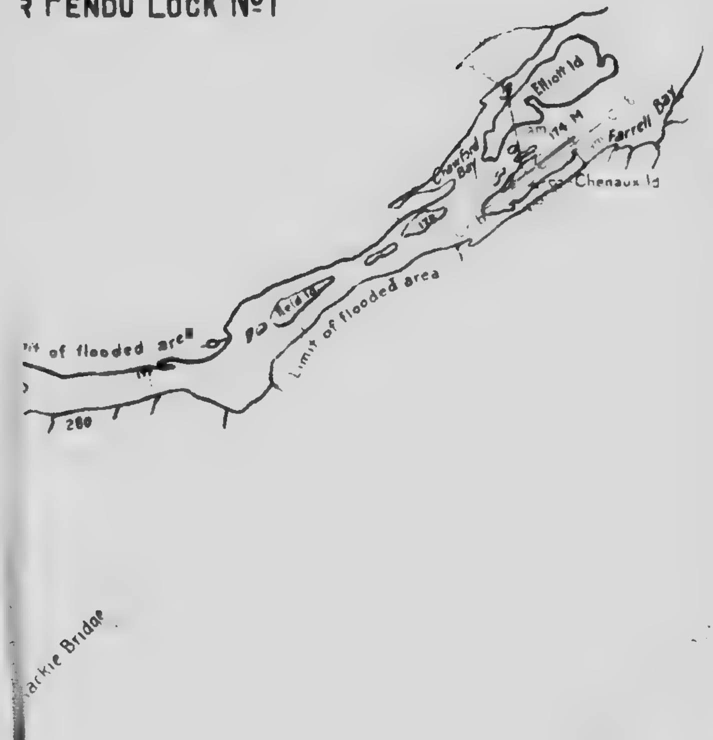

FITZROY HARBOUR
Norway Bay
AND POINT
BRAESIDE
CHATS
LAKE
CANADIAN PACIFIC RAILW
Limit of flooded Area
Pontiac Bay
LOCK
Dam
Great Chats Isl.
Victoria Isl.
Embankment
Regulating
Lovers Point
Lavergne Bay
Marshall Bay
Mississippi River
Madawaska River
Docharl Creek
165
164
163
162
161
160
159
158
157
245
ada.
P CANAL
ENAUX
ulated Water Surface, Elevation 245.0
ottom of Channel, Elevation 223.0
Tested to Elevation 200.6 (no bottom)
B of C Elev 173.0
165M
160M
155M
J. E. R. Matte, Del.

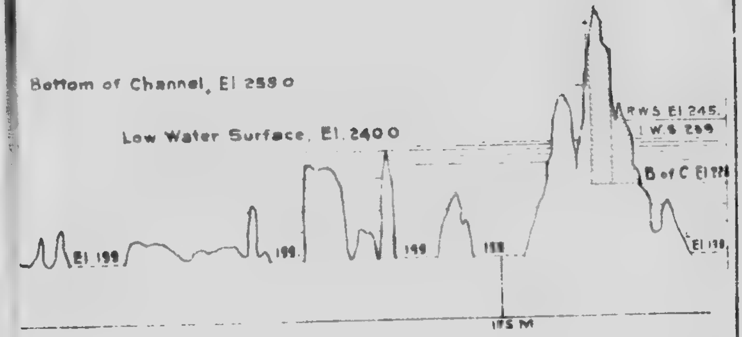
.Canada.

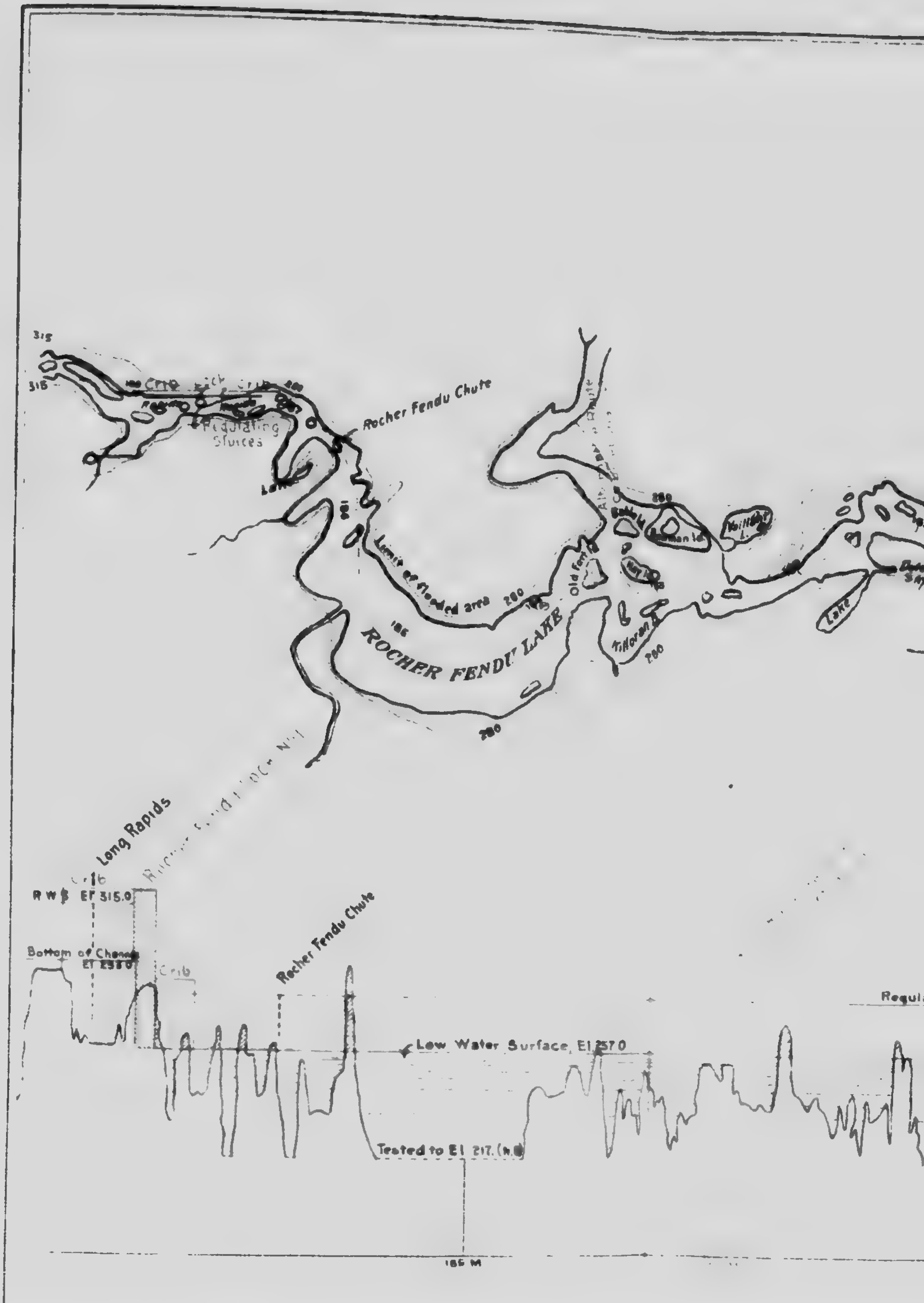
SHIP CANAL

PLAN

Fendu Lock Nº1






315
315
Crib
Crib
280
Regulating
Sluices
Rocher Fendu Chute
Lake
Limit of flooded area
280
185
ROCHER FENDU LAKE
Old Fort
280
280
Lake
Long Rapids
Crib
R W S El 315.0
Bottom of Channel
El 238.0
Crib
Rocher Fendu Chute
Low Water Surface, El 257.0
Tested to El 217.
185 M
Regul

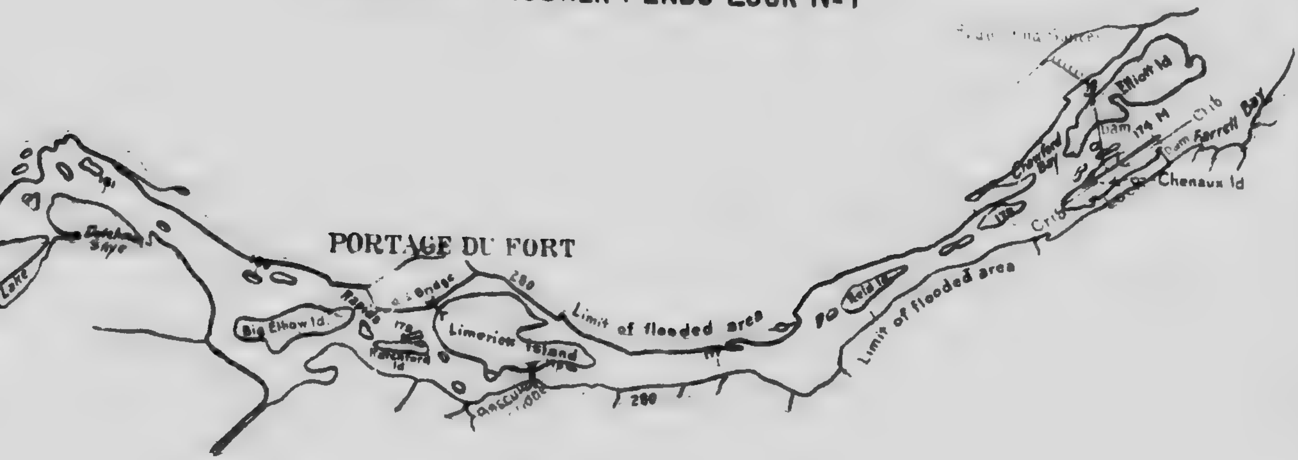
Nº 9

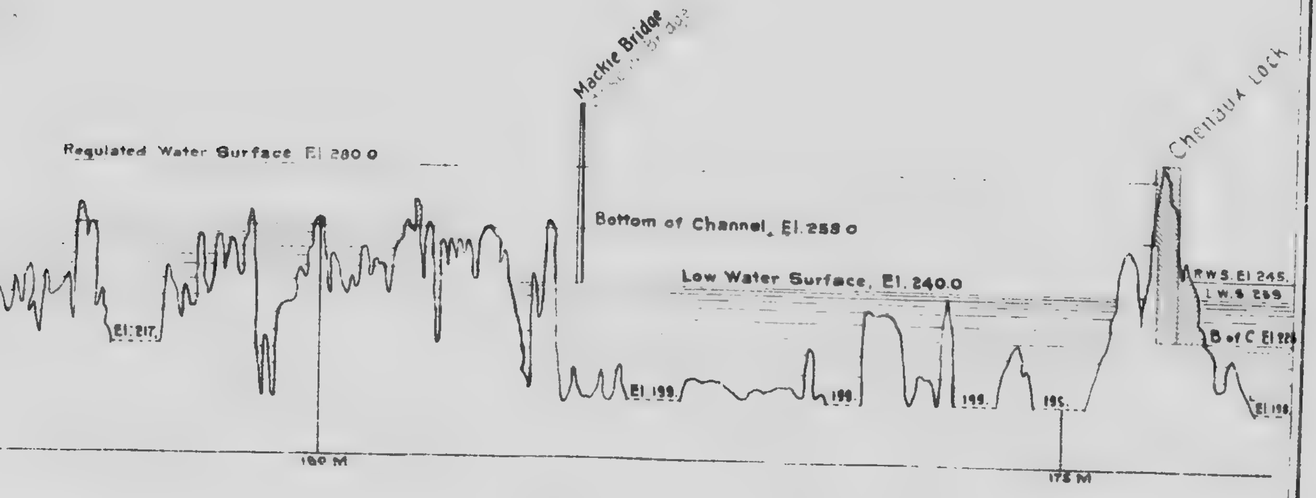
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

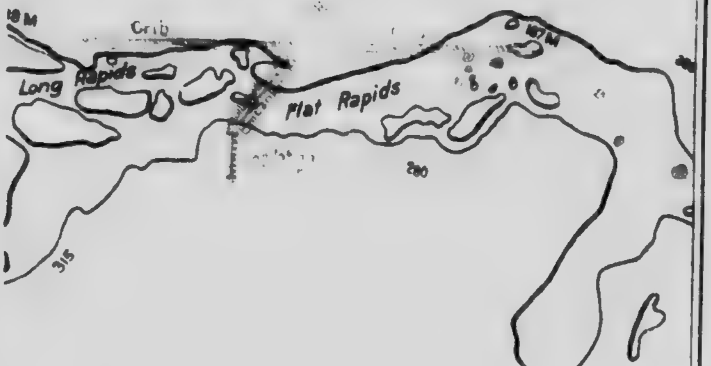
ESTIMATE PLAN

CHENAUX TO ROCHER FENDU LOCK Nº 1





Nº 10

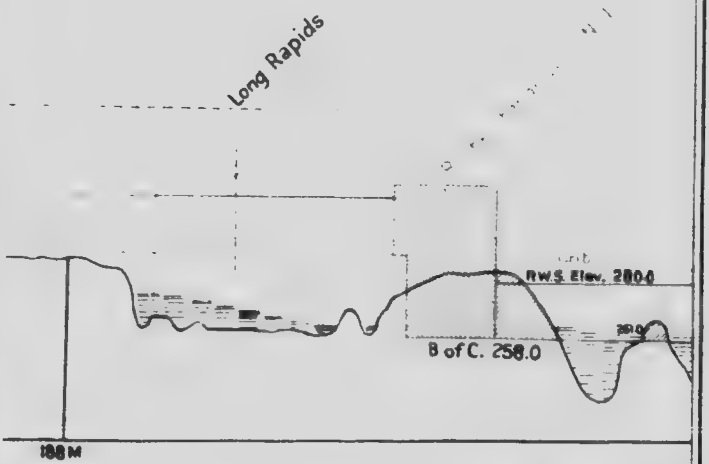


Canada.

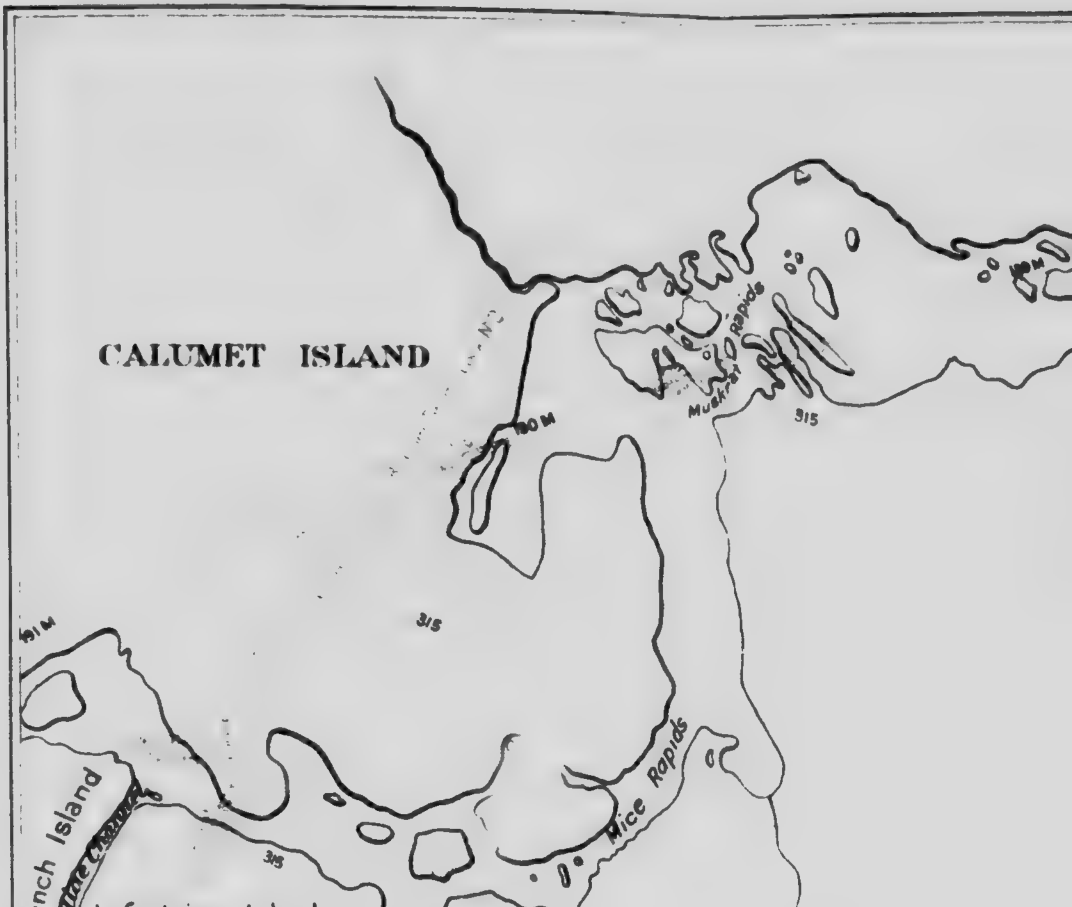
SHIP CANAL

PLAN

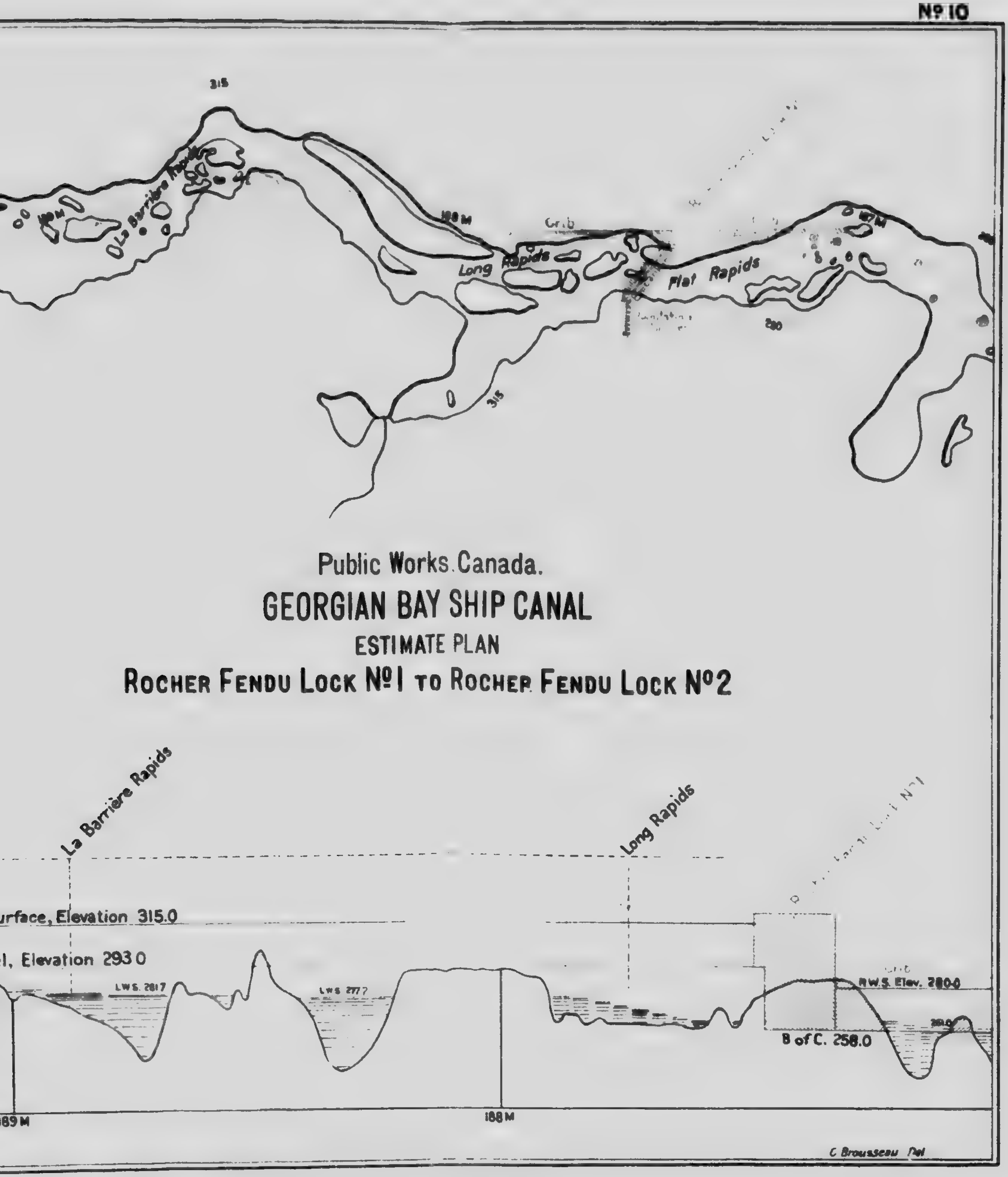
OCHER FENDU LOCK Nº2



C Brousseau Del


CALUMET ISLAND
Muskrat Rapids
315
190 M
191 M
315
French Island
Old Slide Channel
Lafontaine Island
315
Mice Rapids
Lafontaine Rapids
315
Muskrat Rapids
H.W.S. El 350
B of C El 328
L.W.S.
Regulated Water Surface, Elev
Bottom of Channel, Elevation
190 M
189 M

Nº 10



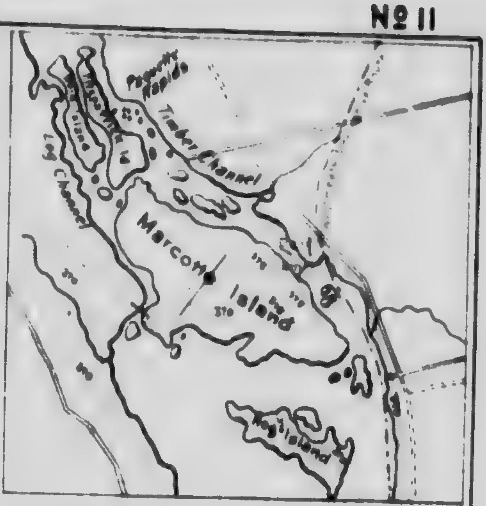
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

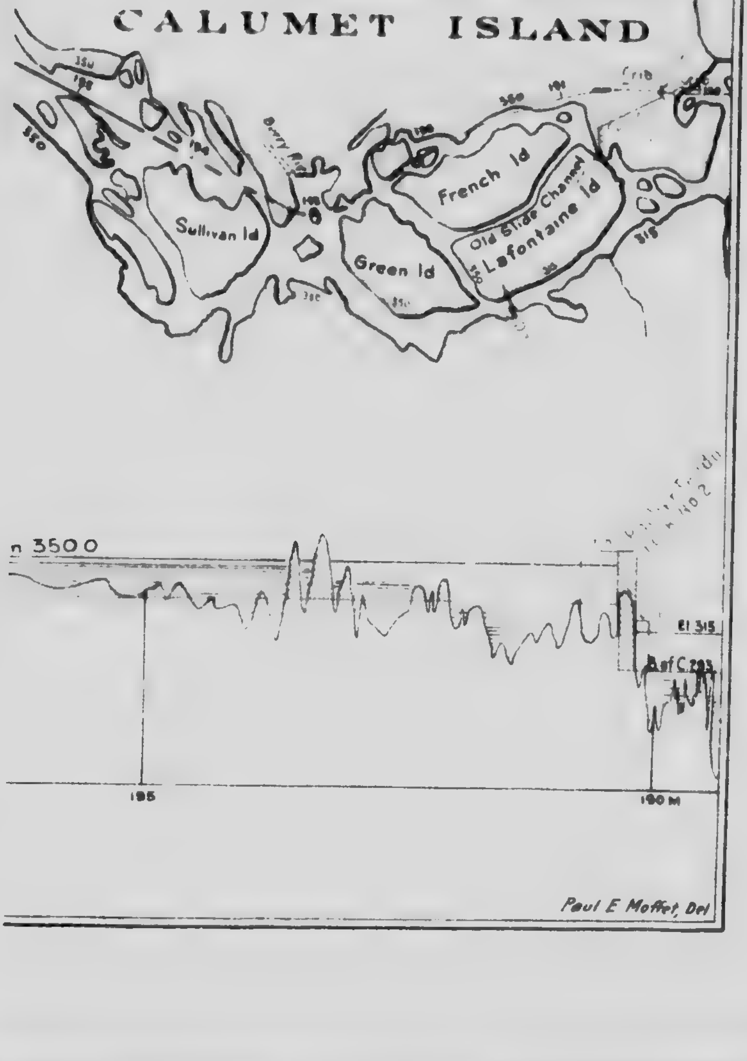
ESTIMATE PLAN

ROCHER FENDU LOCK Nº 1 TO ROCHER FENDU LOCK Nº 2

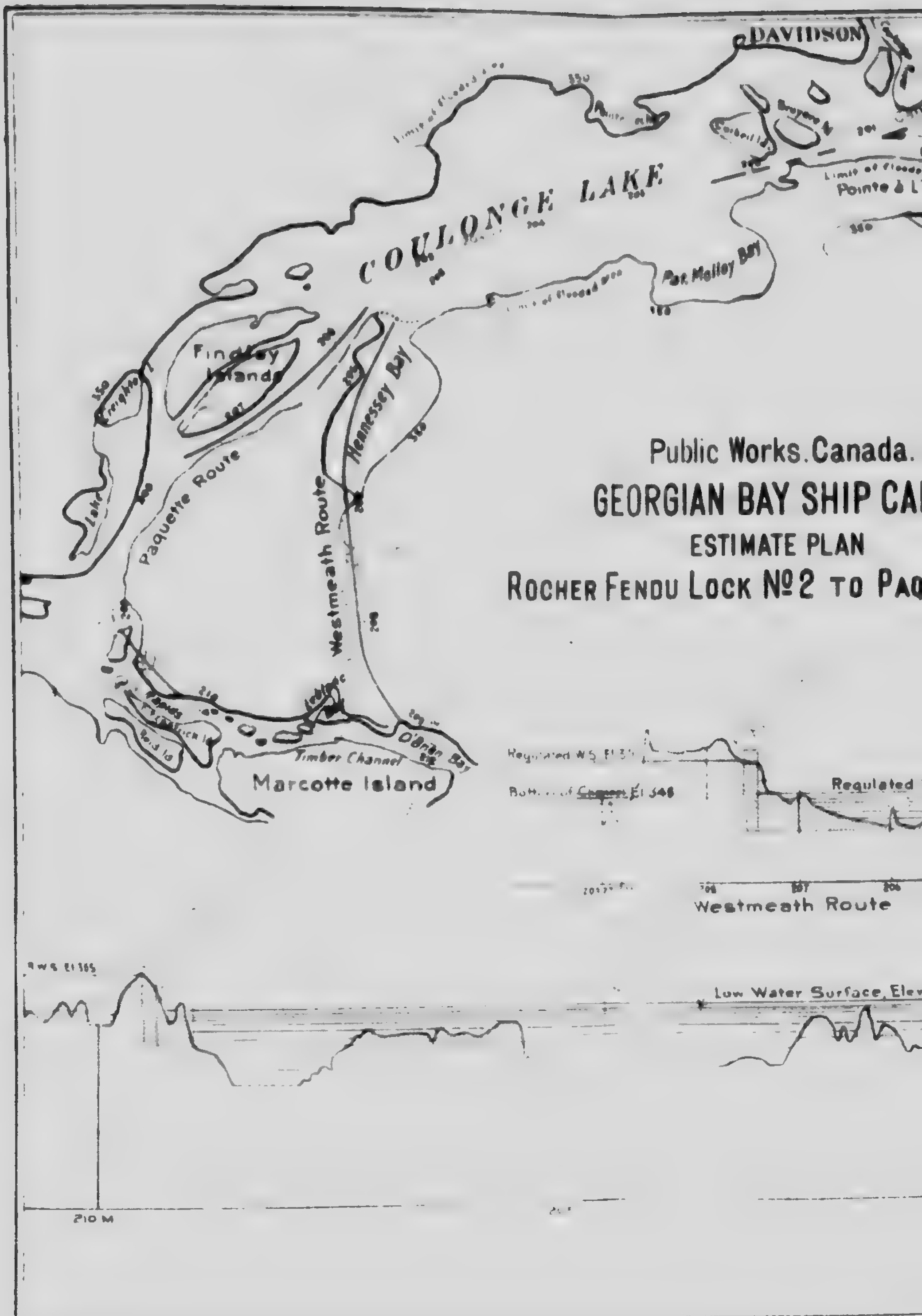
Nº 11



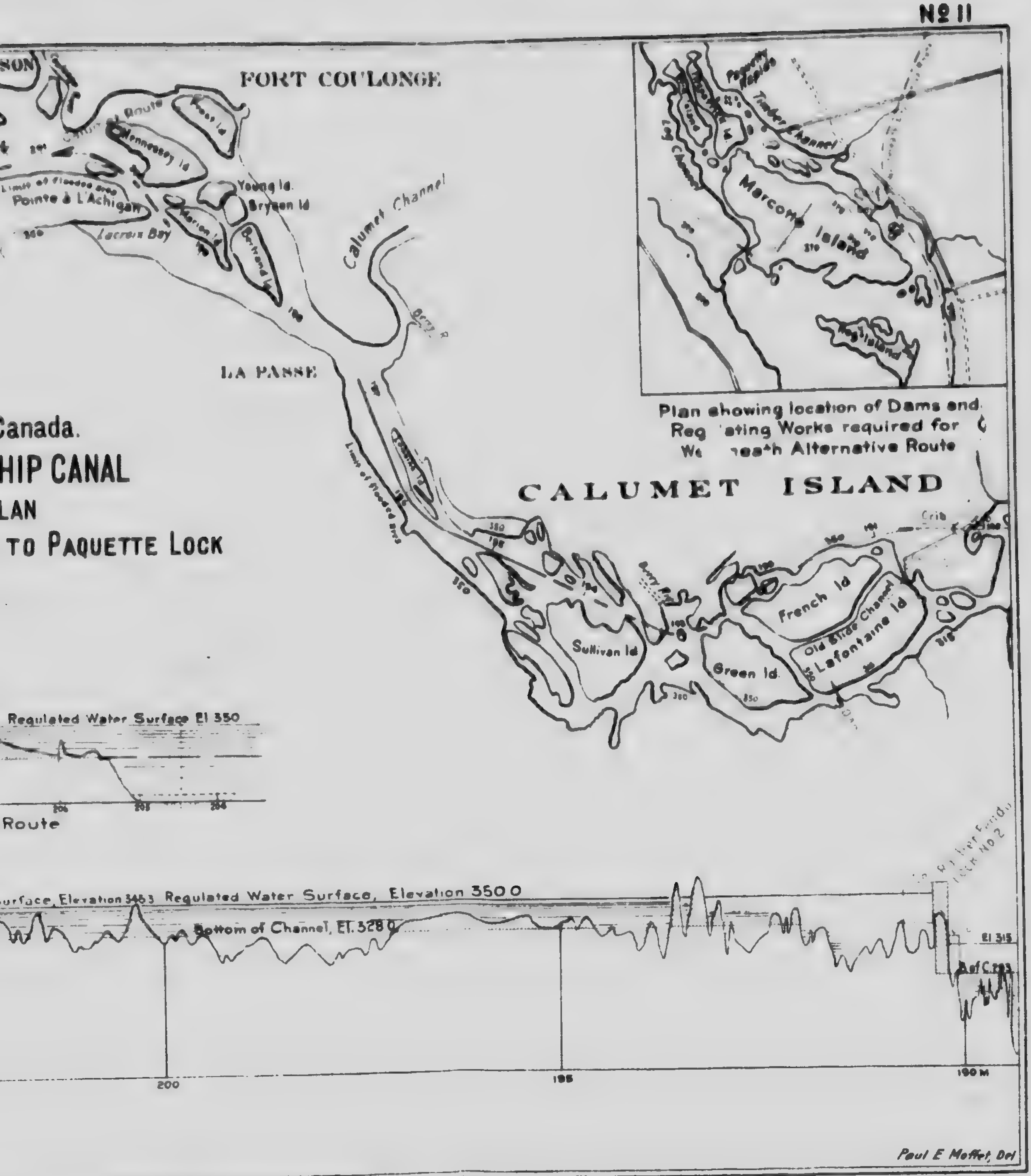
Plan showing location of Dams and Regulating Works required for Westmeath Alternative Route



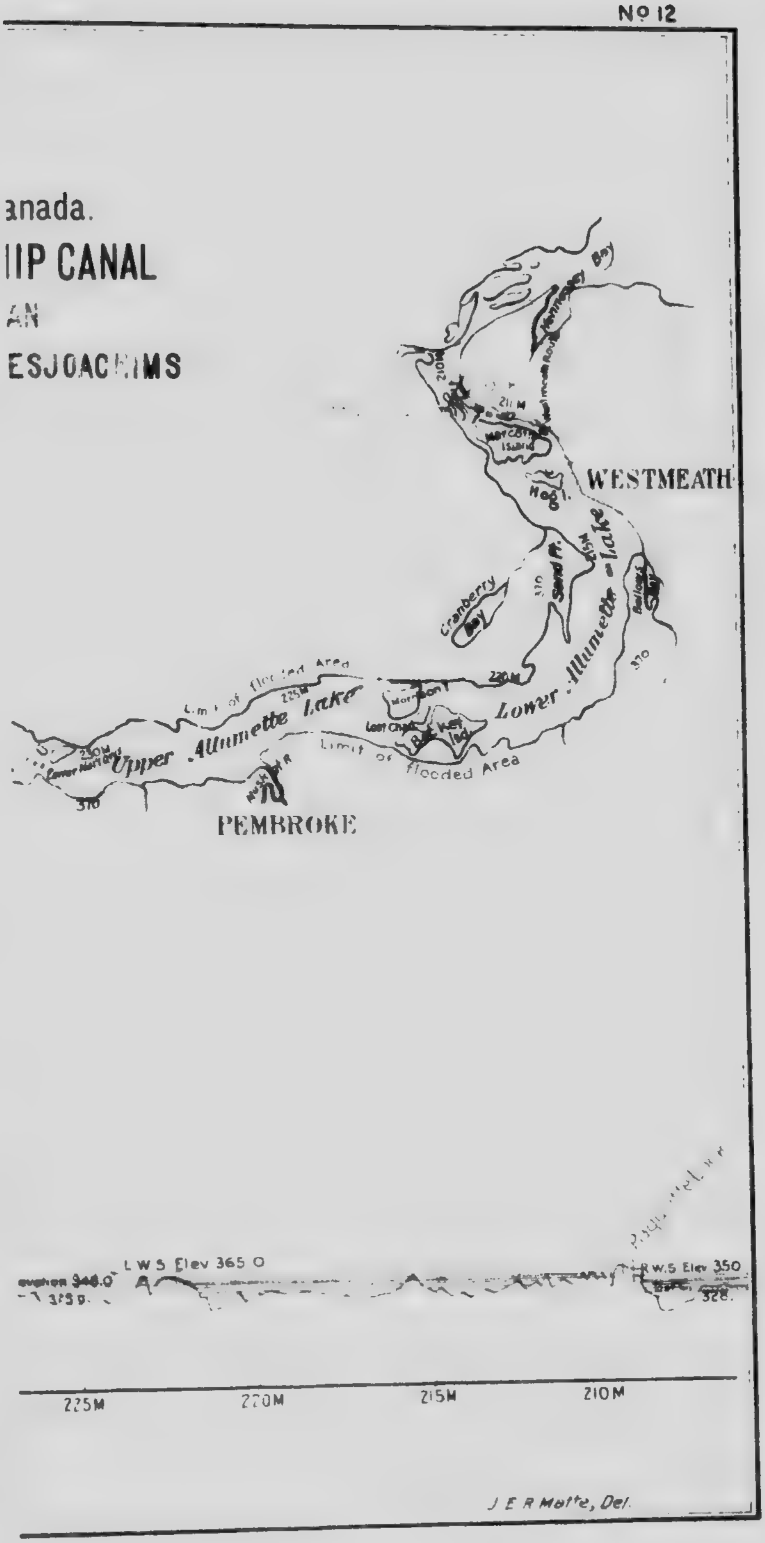
Paul E Moffet, Del


Public Works. Canada.
GEORGIAN BAY SHIP CA
ESTIMATE PLAN
ROCHER FENDU LOCK Nº2 TO PA
COULONGE LAKE
DAVIDSON
Pointe à L
Pat Malloy Bay
Findley Islands
Hennessey Bay
Paquette Route
Westmeath Route
Timber Channel
Marcotte Island
O'Brien Bay
Reid Id
Limit of Flooded Area
Regulated
Westmeath Route
Low Water Surface, Elev
210 M

Nº 11


Canada.
HIP CANAL
LAN
TO PAQUETTE LOCK
FORT COULONGE
Fosse Id
Hennessey Id
Young Id.
Bryson Id
Pointe à L'Achigan
Lacroix Bay
Calumet Channel
LA PASSE
Limit of flooded area
CALUMET ISLAND
Sullivan Id
Green Id.
French Id
Lafontaine Id
Old Slide Channel
Crib
Dam
Plan showing location of Dams and Reg 'ating Works required for Wa 1ea*h Alternative Route
Marcotte Island
Trader Channel
Regulated Water Surface El 350
Route
Regulated Water Surface, Elevation 350.0
Bottom of Channel, El. 328.0
El 315
200
195
190 M
Paul E Moffet, Del

No 12

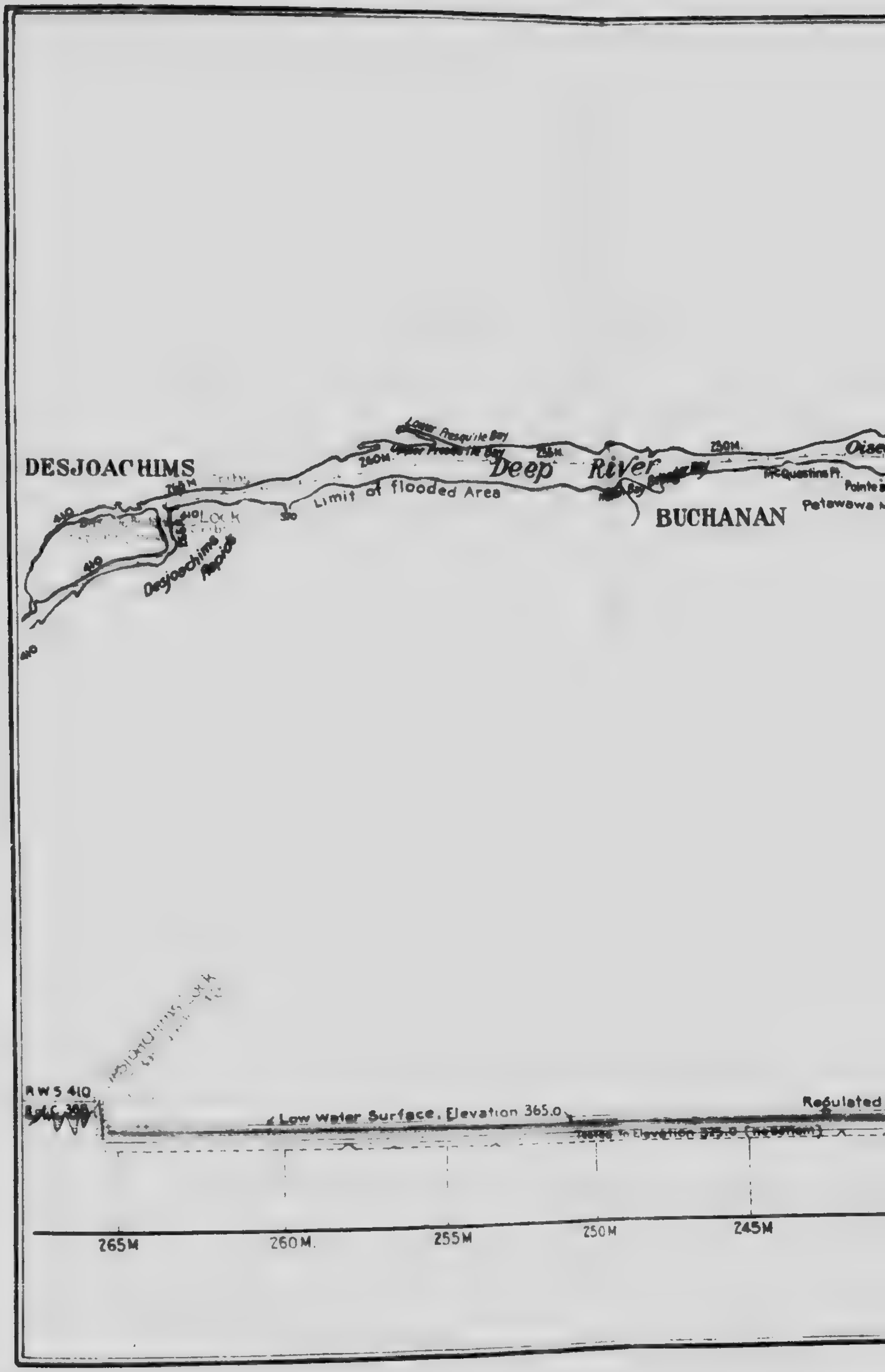


anada.

IIP CANAL

AN

ESJOACHIMS


DESJOACHIMS
Lower Presqu'ile Bay
Upper Presqu'ile Bay
260M.
255M.
250M.
Deep River
Oise
Pointe
Petawawa
265M
410
Lock
390
Limit of flooded Area
Desjoachims Rapids
BUCHANAN
R.W.S. 410
Low Water Surface, Elevation 365.0
Regulated
265M
260M.
255M
250M
245M

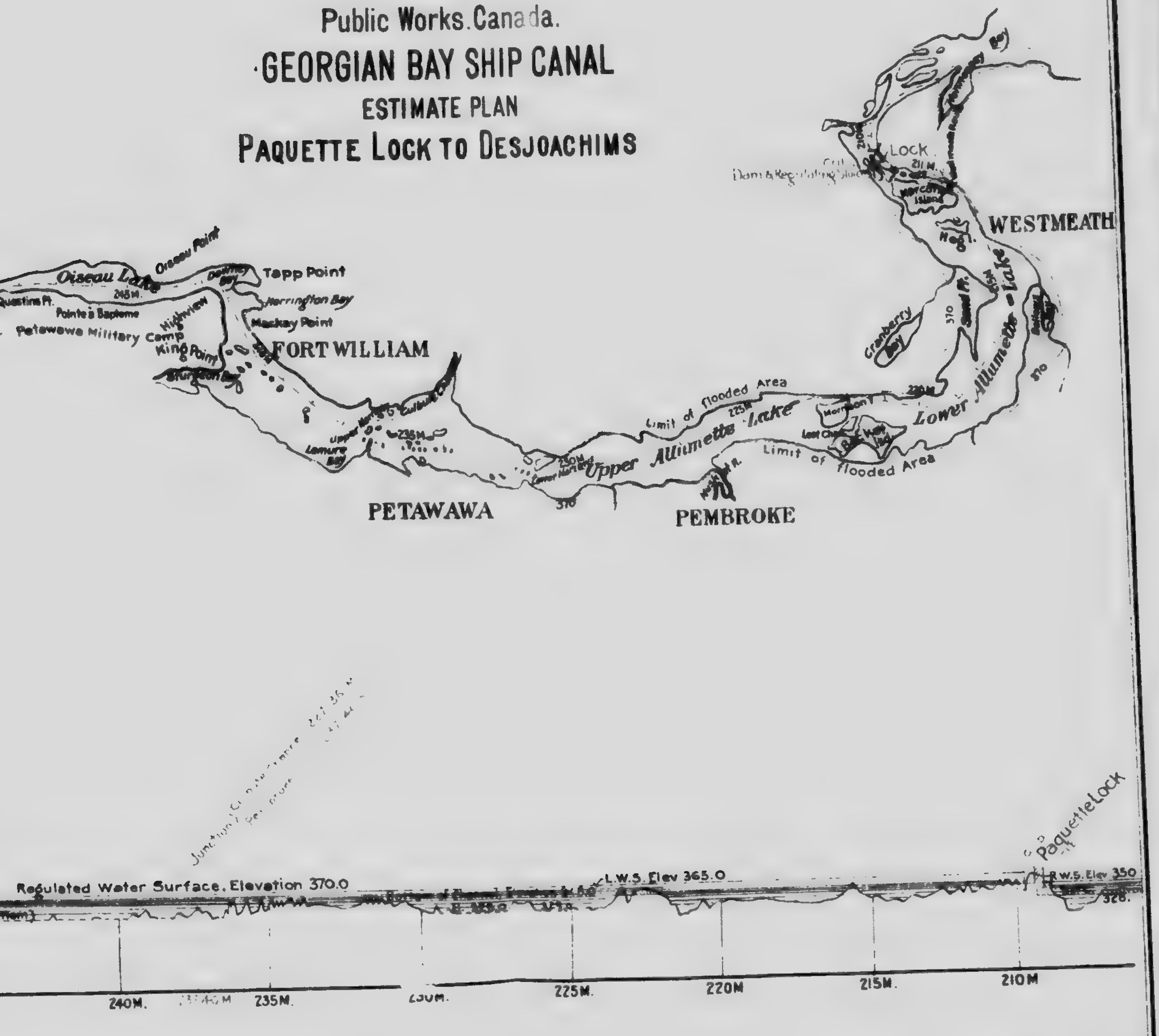
Nº 12

Public Works. Canada.

GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

PAQUETTE LOCK TO DESJOACHIMS



J. E. R. Motte, Del.

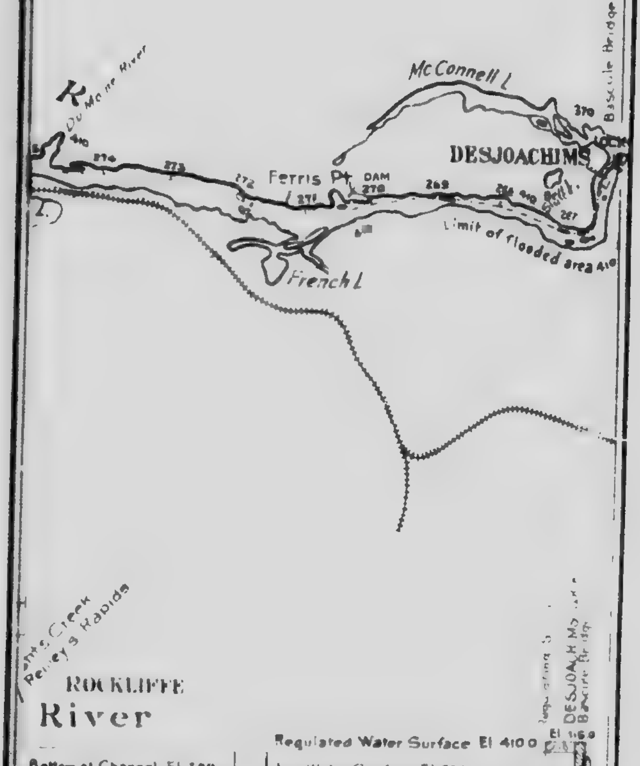
Nº 13

blic Works. Canada.

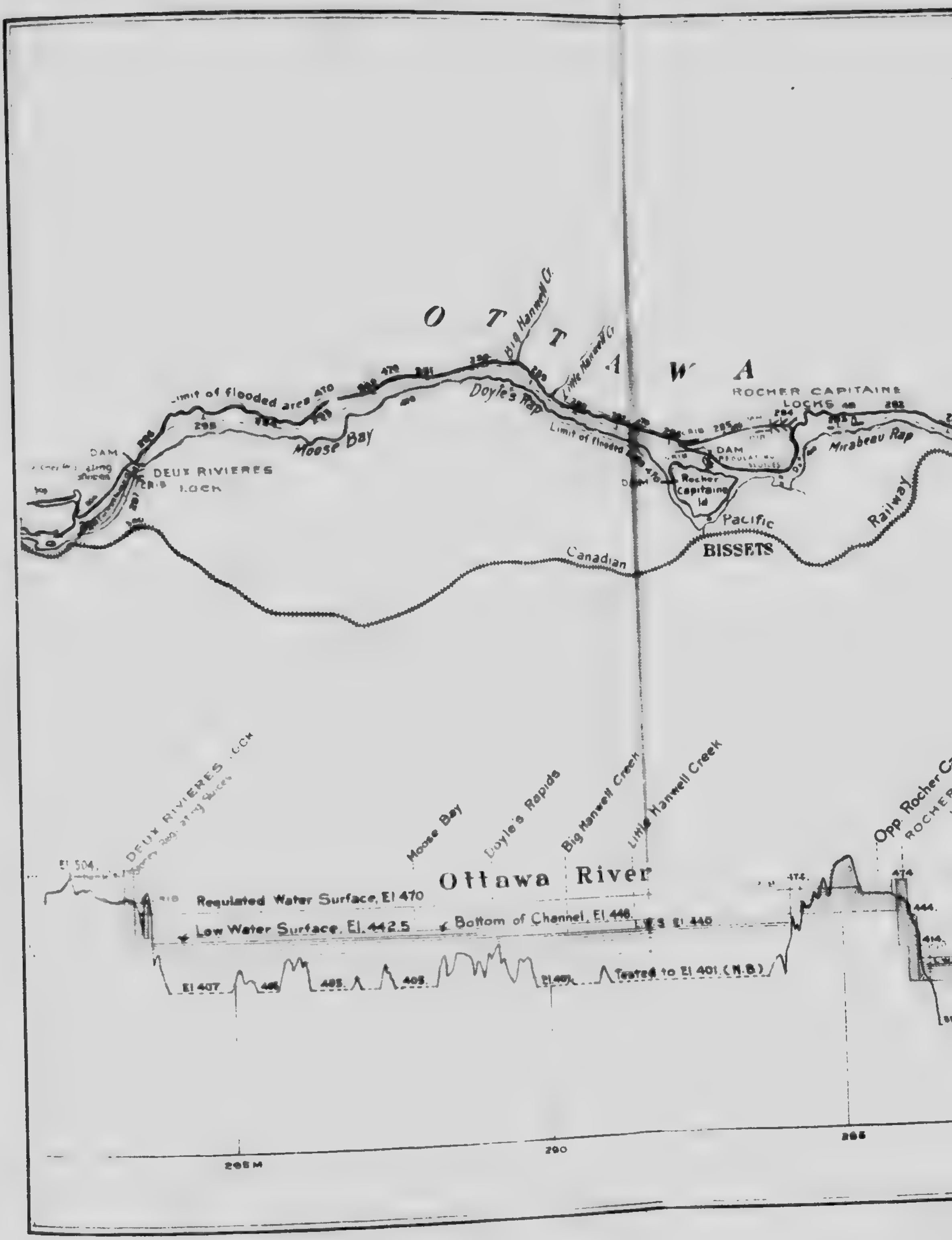
IAN BAY SHIP CANAL

ESTIMATE PLAN

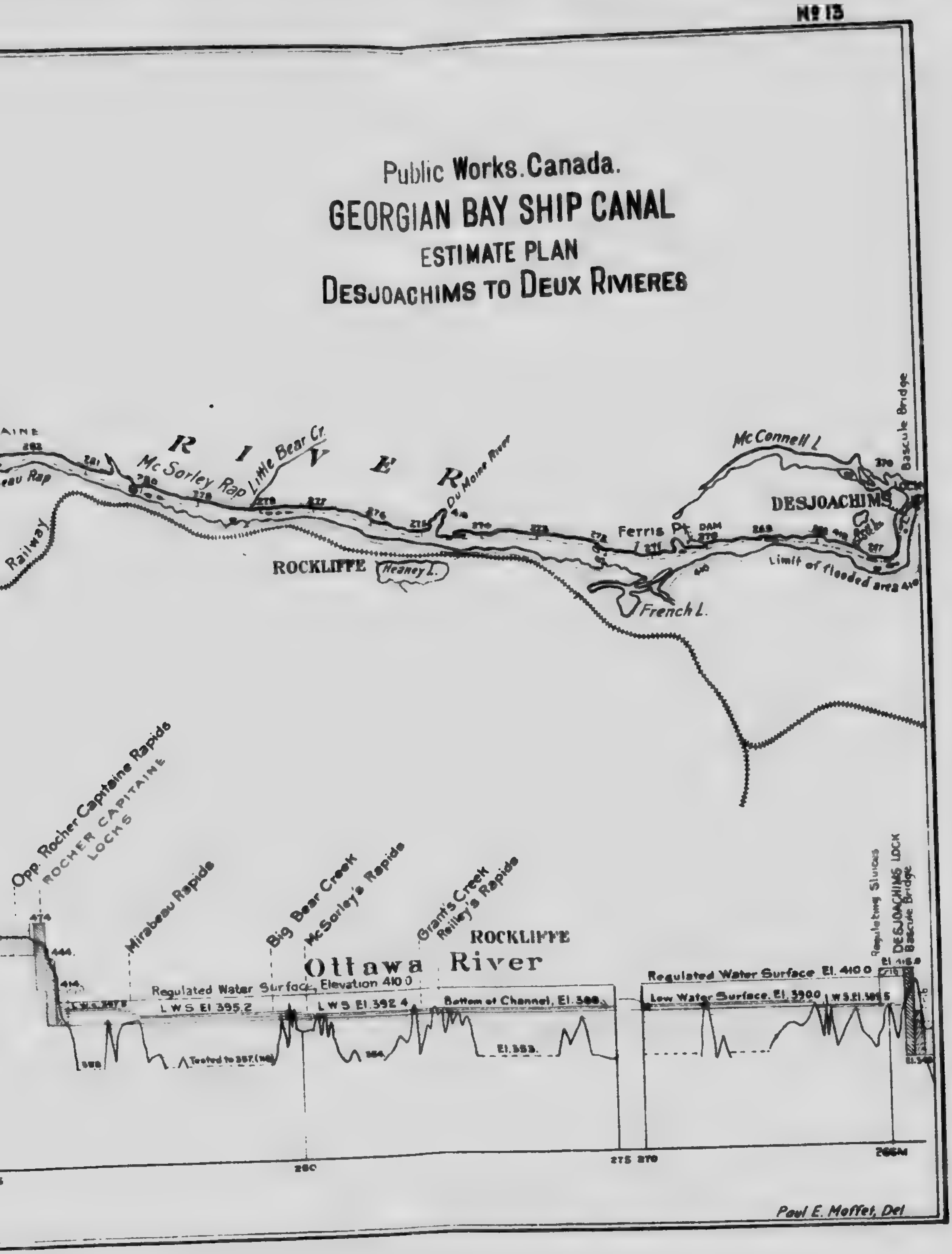
CHIMS TO DEUX RIVIERES



Paul E. Moffet, Del.


O T T A W A
Big Hanwell Cr.
Little Hanwell Cr.
Limit of flooded area 470
Doyle's Rap
Limit of flooded
Moose Bay
DAM
DEUX RIVIERES
CRIB LOCK
ROCHER CAPITAINE
LOCKS
DAM
Rocher Capitaine Id
Mirabeau Rap
Canadian
Pacific
Railway
BISSETS
DEUX RIVIERES LOCK
Moose Bay
Doyle's Rapids
Big Hanwell Creek
Little Hanwell Creek
Opp. Rocher C
ROCHER
El. 504
Ottawa River
Regulated Water Surface, El. 470
Low Water Surface, El. 442.5
Bottom of Channel, El. 448.
L.W.S. El. 440
El. 407
Tested to El. 401. (N.B.)
474
444.
285M
290
295

Nº 13



Public Works. Canada.

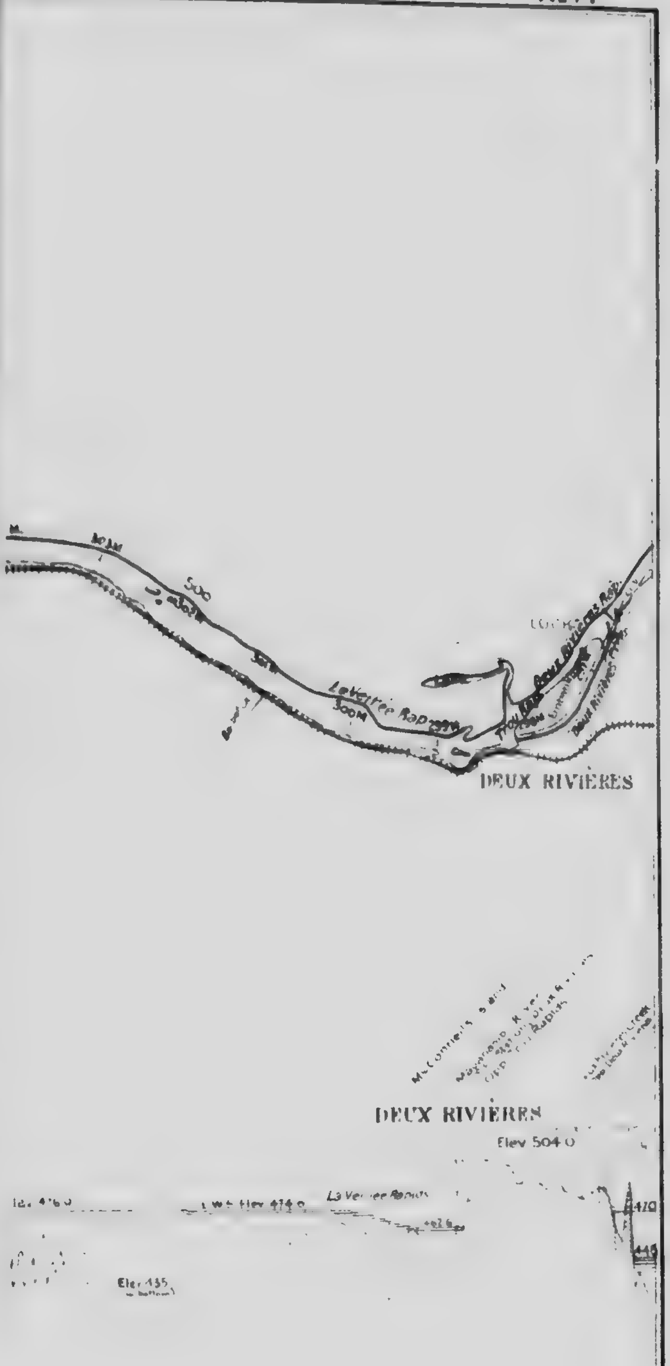
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

DESJOACHIMS TO DEUX RIVIERES

Paul E. Moffet, Del.

Nº 14

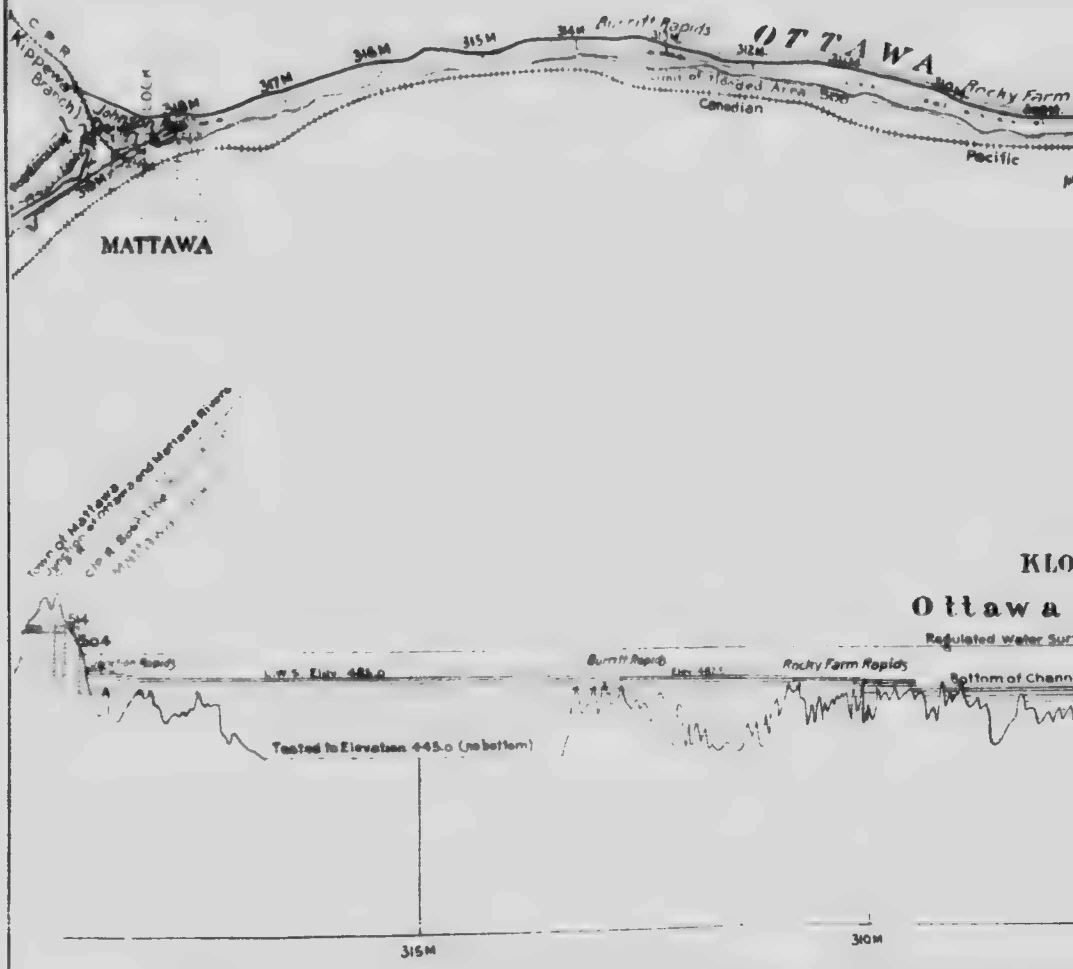

500
300M
Levertee Rapids
Trou
Deux Rivières Rap.
Deux Rivières
LOCKS
DEUX RIVIÈRES
McConnell's Sand
DEUX RIVIÈRES
Elev 504 0
La Veuee Rapids
L.W. Elev 414 0
Elev 435
410
300M

Public Works

GEORGIAN BAY

ESTIMATE

DEUX RIVIERES



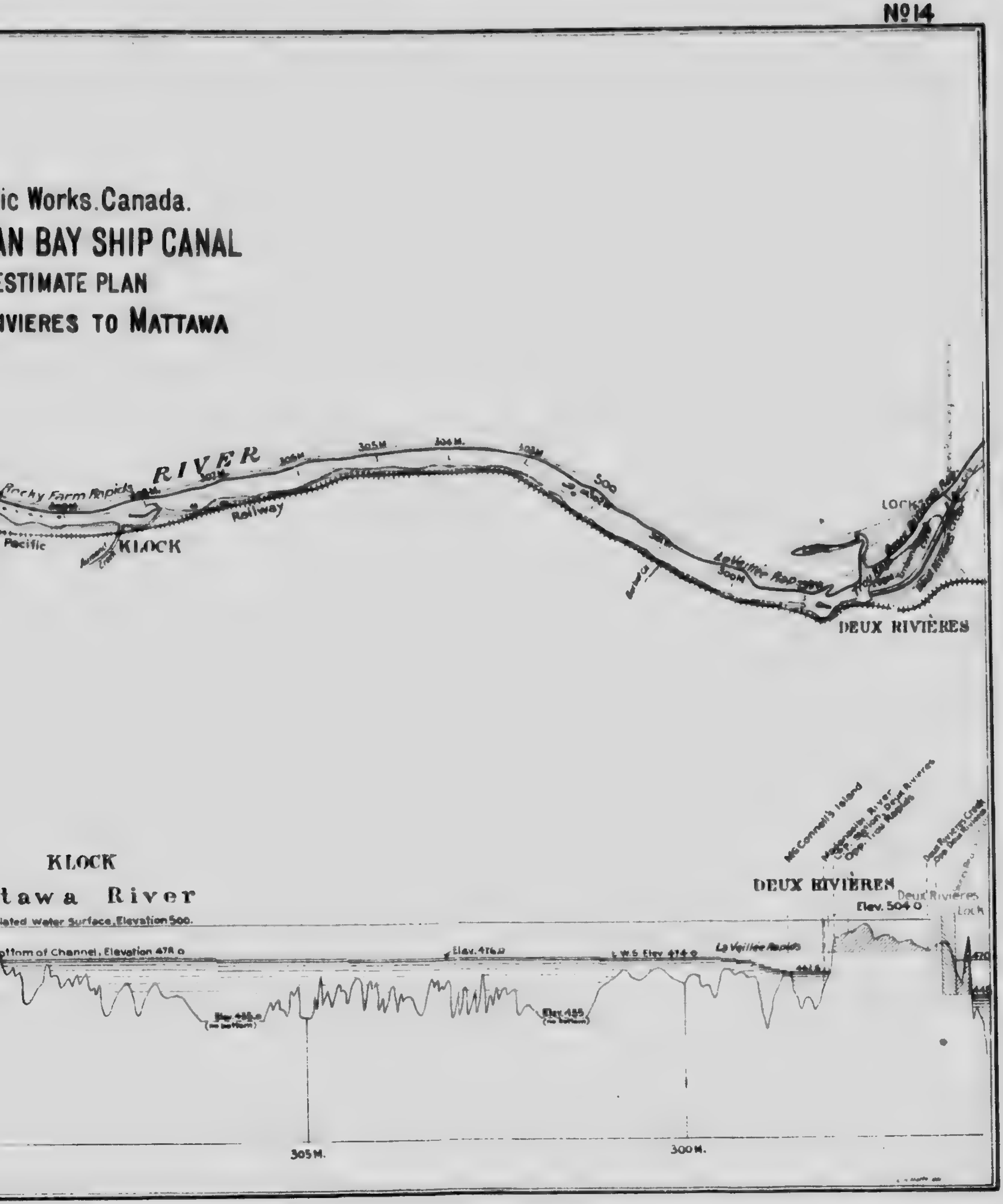
Nº14

ic Works. Canada.

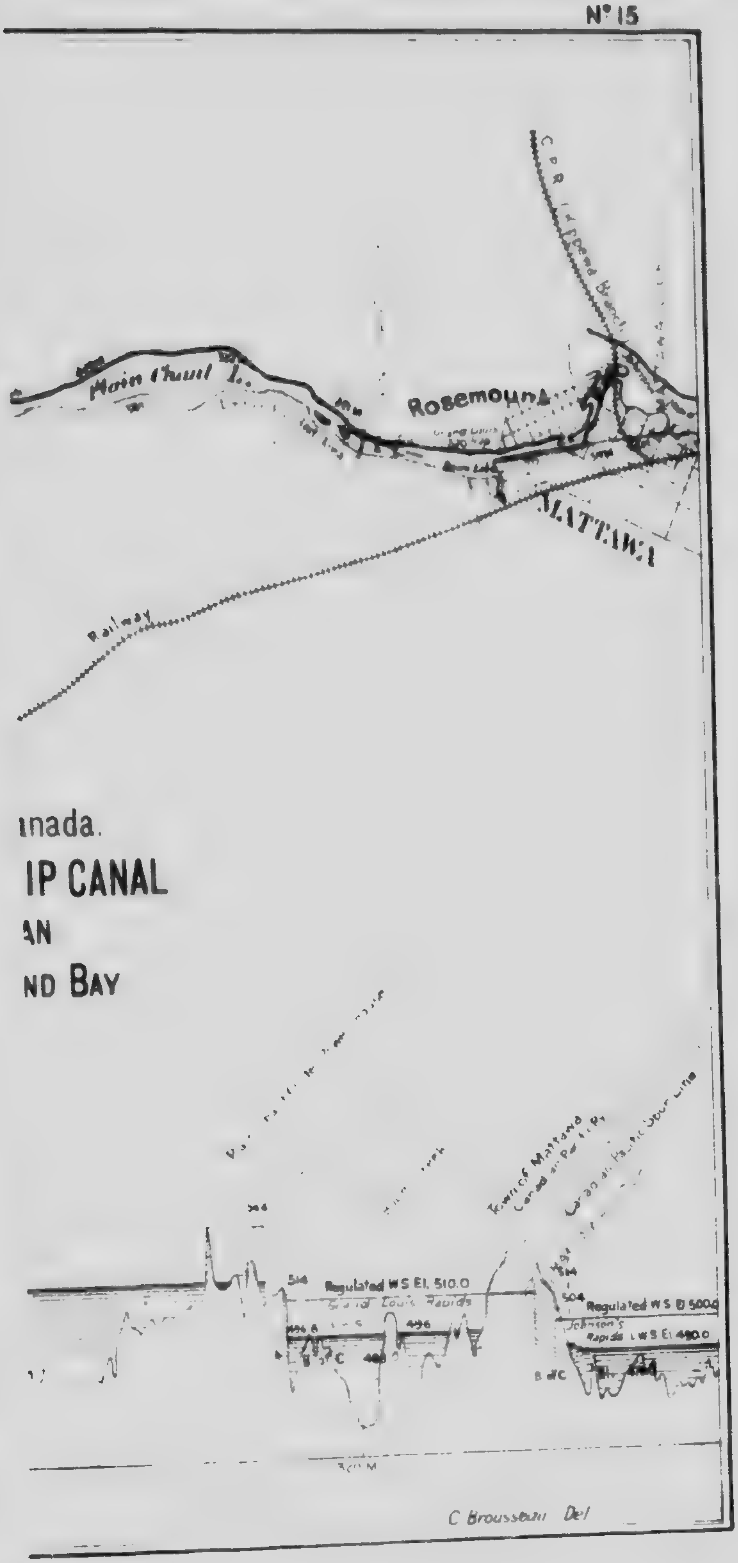
AN BAY SHIP CANAL

ESTIMATE PLAN

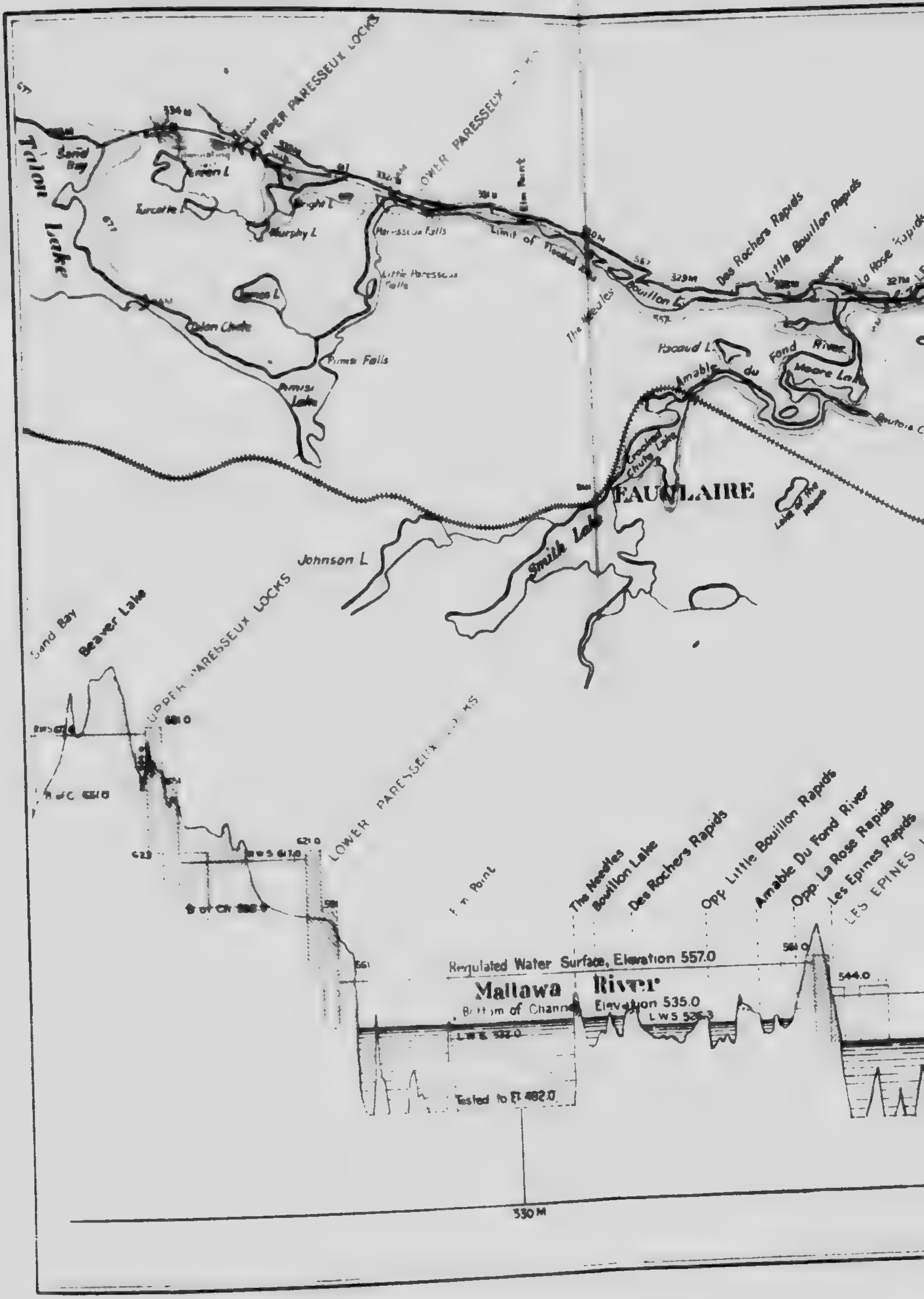
VIERES TO MATTAWA



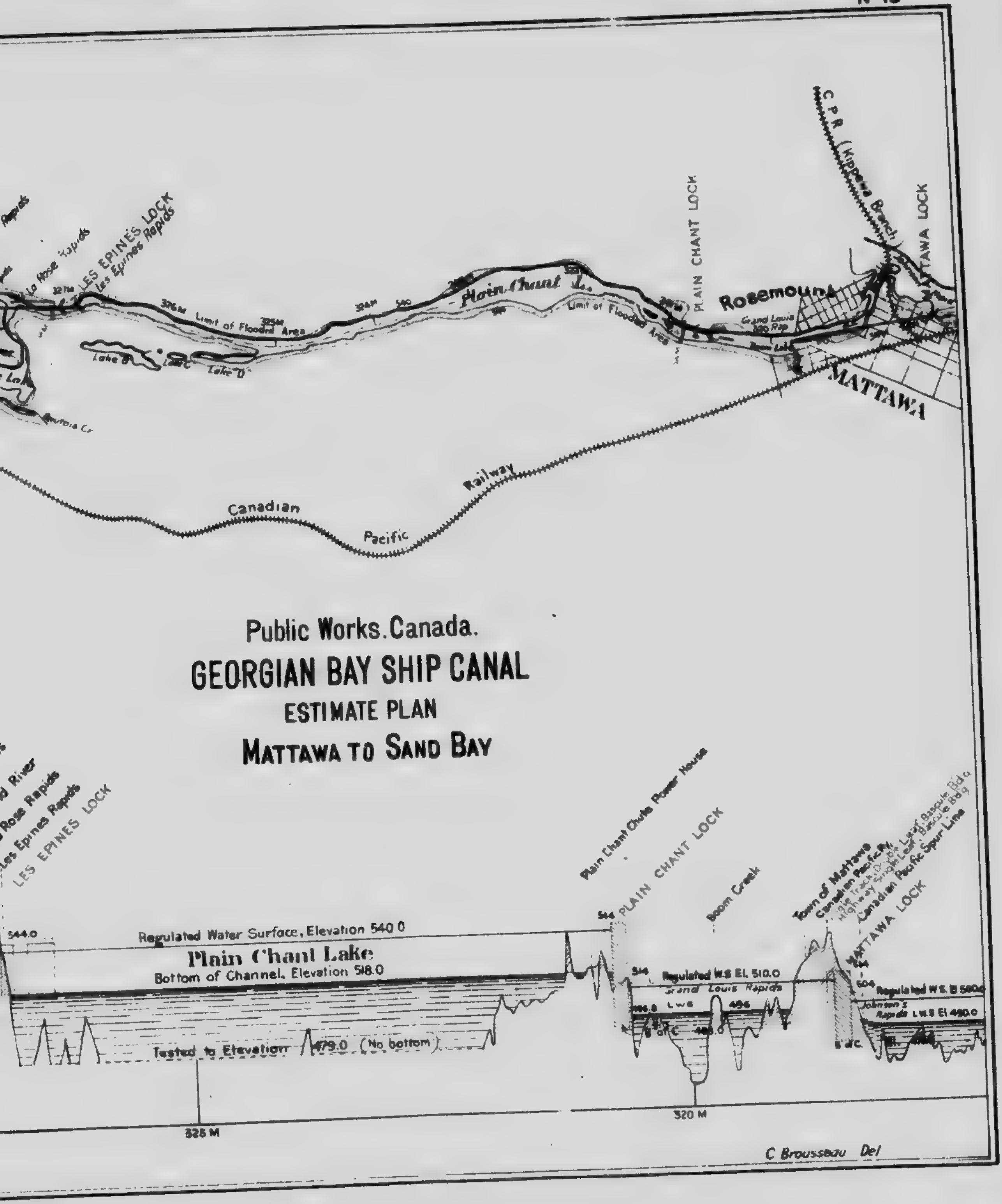
Nº 15



Main Channel
Rosemount
Grand Louis
Mattawa
C.P.R. Temiscaming Branch
Railway
anada.
IP CANAL
AN
ND BAY
Town of Mattawa
Canadian Pacific Ry
Regulated W.S. El. 510.0
Grand Louis Rapids
Regulated W.S. El. 500.0
Johnson's Rapids L.W.S. El. 490.0
514
504
496
C Brousseau Del


Talon Lake
Sand Bay
Green L
Turcotte L
Murphy L
Wright L
UPPER PARESSEUX LOCKS
LOWER PARESSEUX LOCKS
Paresseux Falls
Little Paresseux Falls
Jones L
Talon Chute
Pimisi Falls
Pimisi Lake
Limit of Flooded
The Needles
Bouillon L
Des Rochers Rapids
Little Bouillon Rapids
La Rose Rapids
Pacaud L
Amable du Fond River
Moore Lake
Crooked Chute Lake
EAU CLAIRE
Smith Lake
Johnson L
334 M
331 M
330 M
329 M
557
Sand Bay
Beaver Lake
UPPER PARESSEUX LOCKS
LOWER PARESSEUX LOCKS
681.0
621.0
623
B of C 651.0
B of Ch
LWS 617.0
561
Regulated Water Surface, Elevation 557.0
Mattawa River
Bottom of Channel Elevation 535.0
LWS 532.0
LWS 526.3
Tested to El 482.0
The Needles
Bouillon Lake
Des Rochers Rapids
Opp Little Bouillon Rapids
Amable Du Fond River
Opp. La Rose Rapids
Les Epines Rapids
LES EPINES
561.0
544.0
330 M

Nº 15



Public Works. Canada.

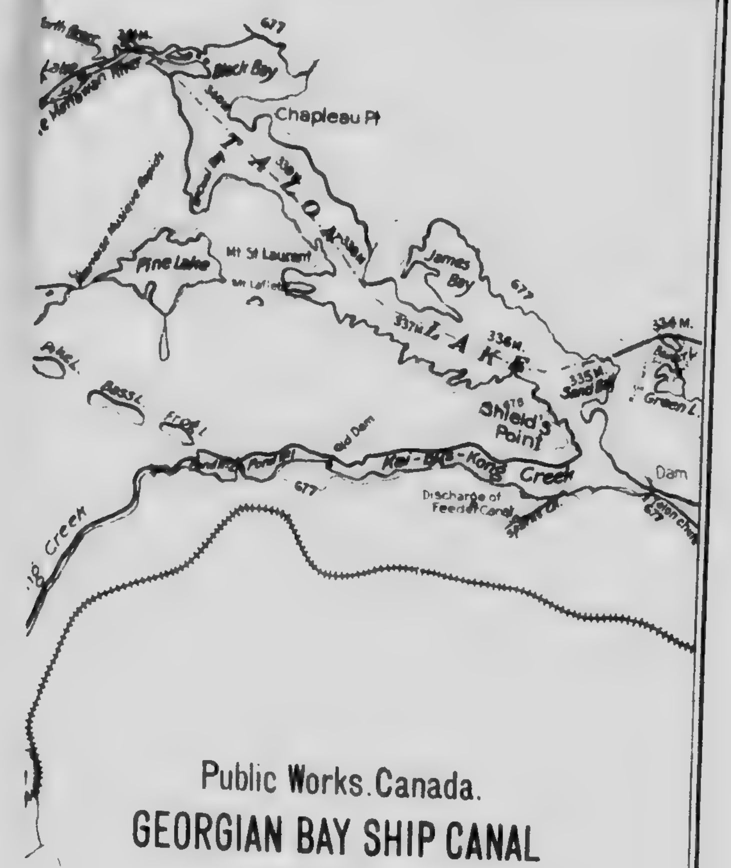
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

MATTAWA TO SAND BAY

C Brousseau Del

Nº 16

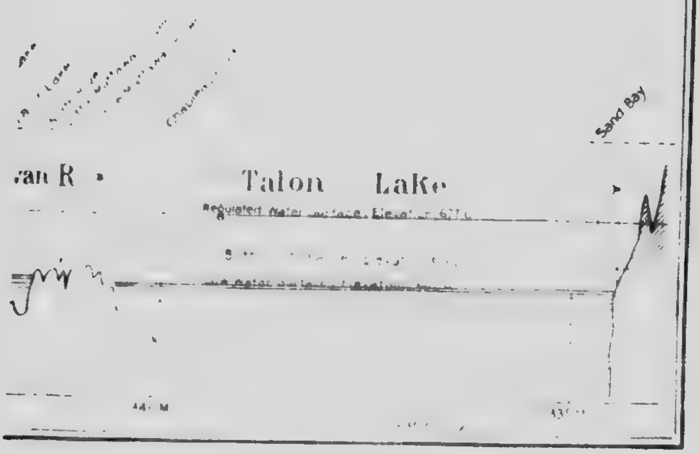


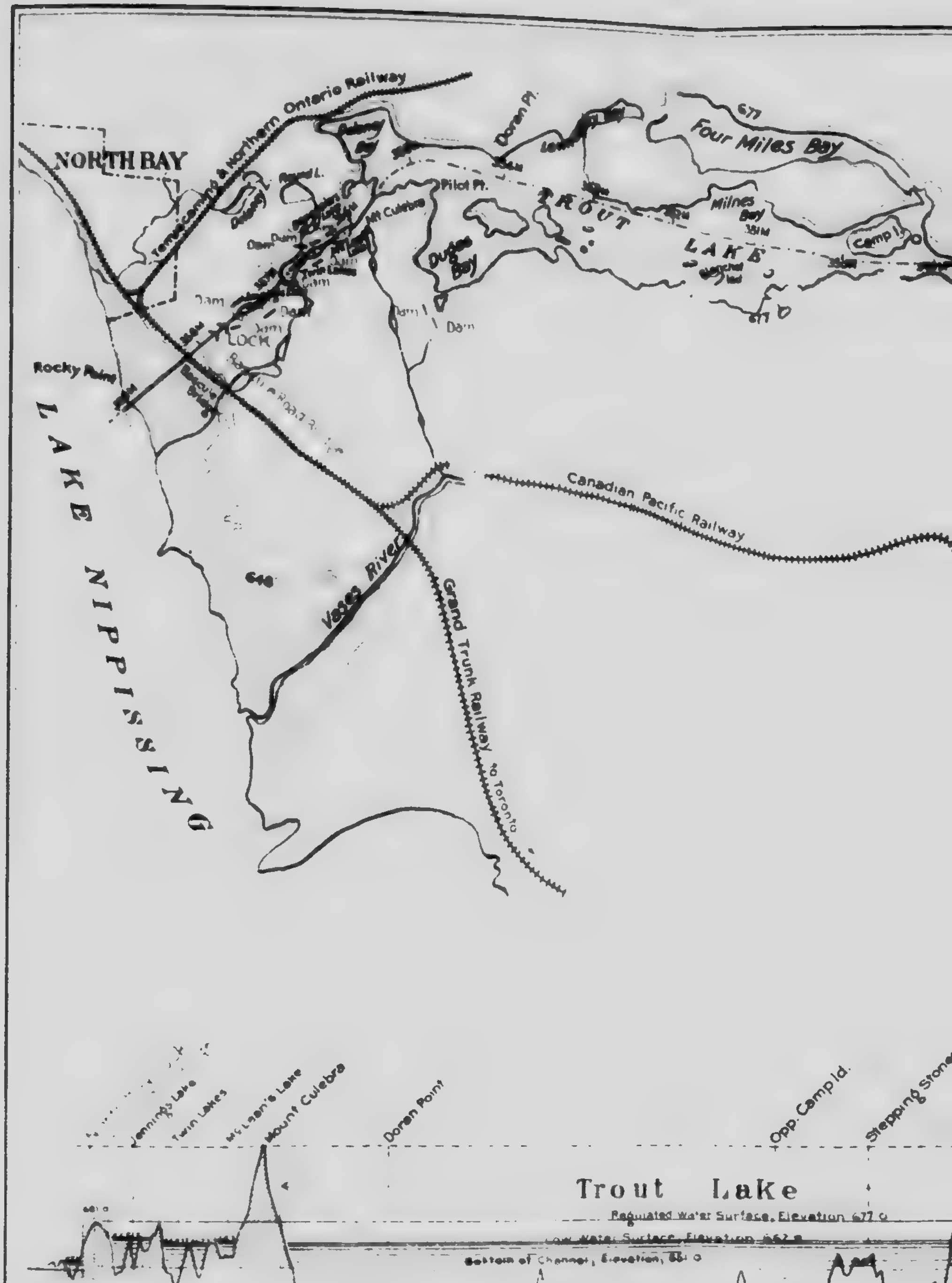
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

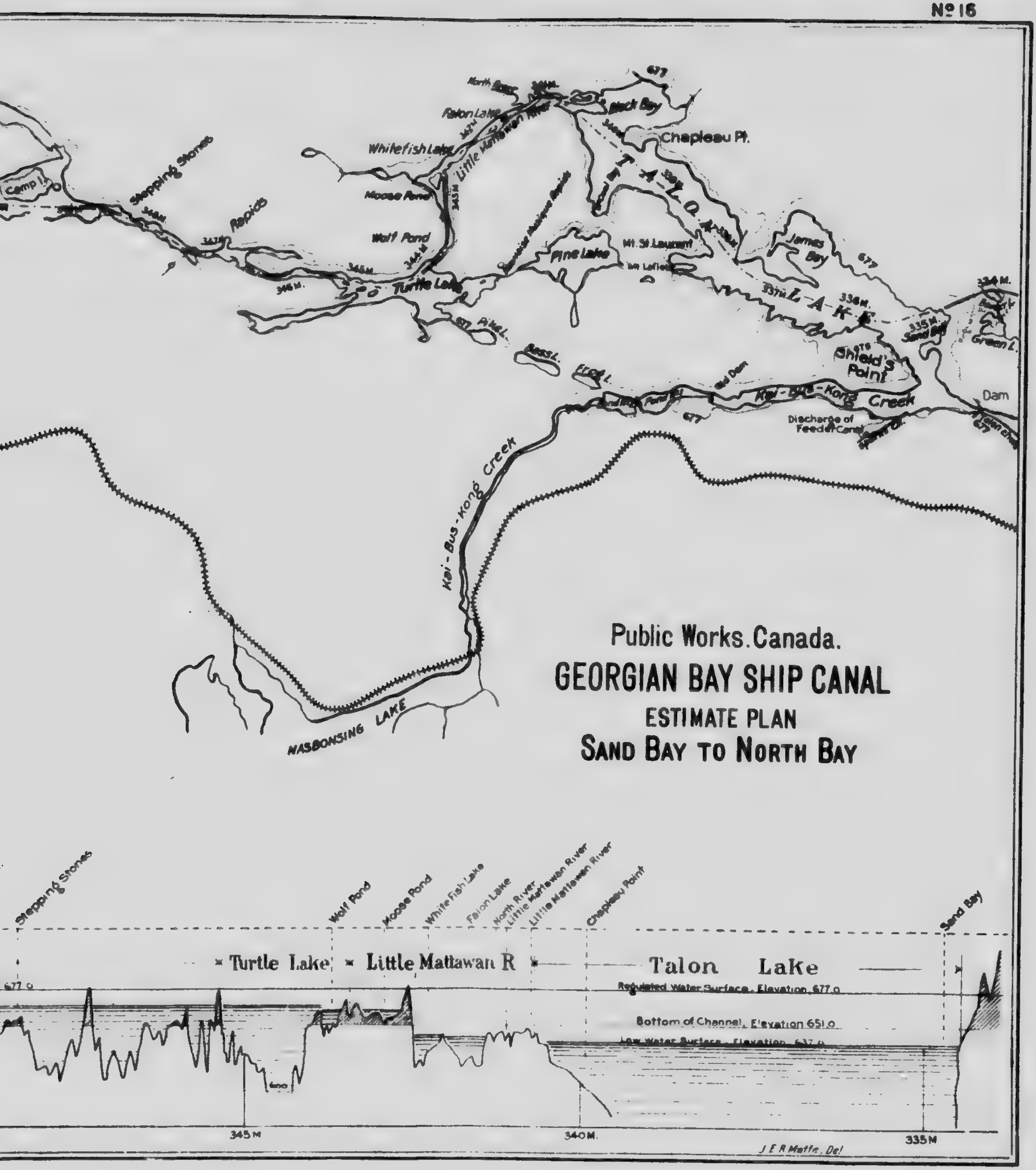
ESTIMATE PLAN

SAND BAY TO NORTH BAY




NORTH BAY
Temiskaming & Northern Ontario Railway
Pilot Pt.
Doran Pt.
Four Miles Bay
677
Mt Culebra
Dugas Bay
TROUT LAKE
Milnes Bay
Camp I.
Dam
LOCK
Rocky Point
LAKE NIPPISSING
Canadian Pacific Railway
Vases River
Grand Trunk Railway
to Toronto
648
Jennings Lake
Twin Lakes
McLaren's Lake
Mount Culebra
Doran Point
Opp. Camp Id.
Stepping Stone
Trout Lake
Regulated Water Surface, Elevation 677.0
Low Water Surface, Elevation 662.0
Bottom of Channel, Elevation
Tested to Elevation
(no bottom)
Elev 626.0
355M.
350M

No 16



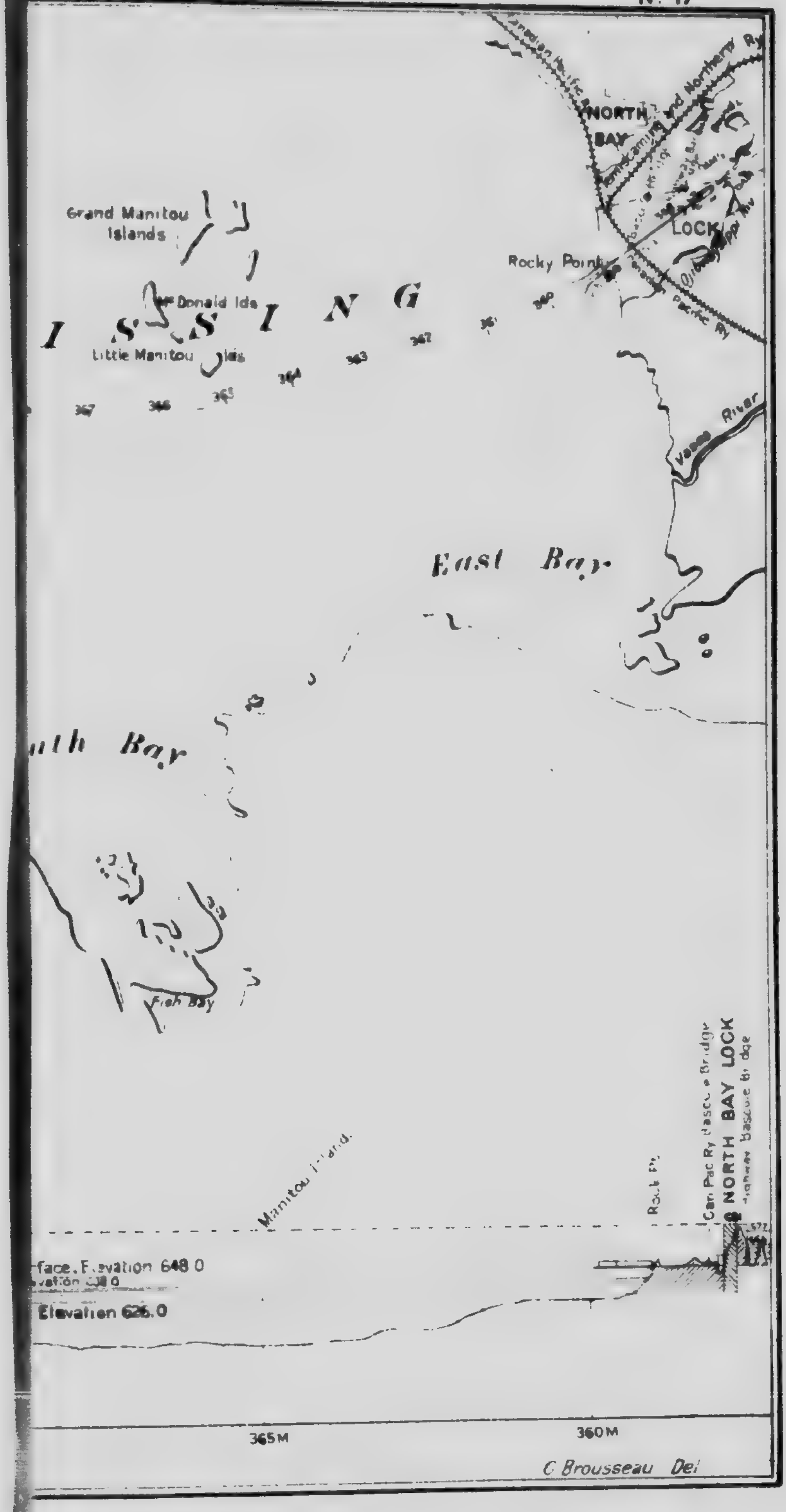
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

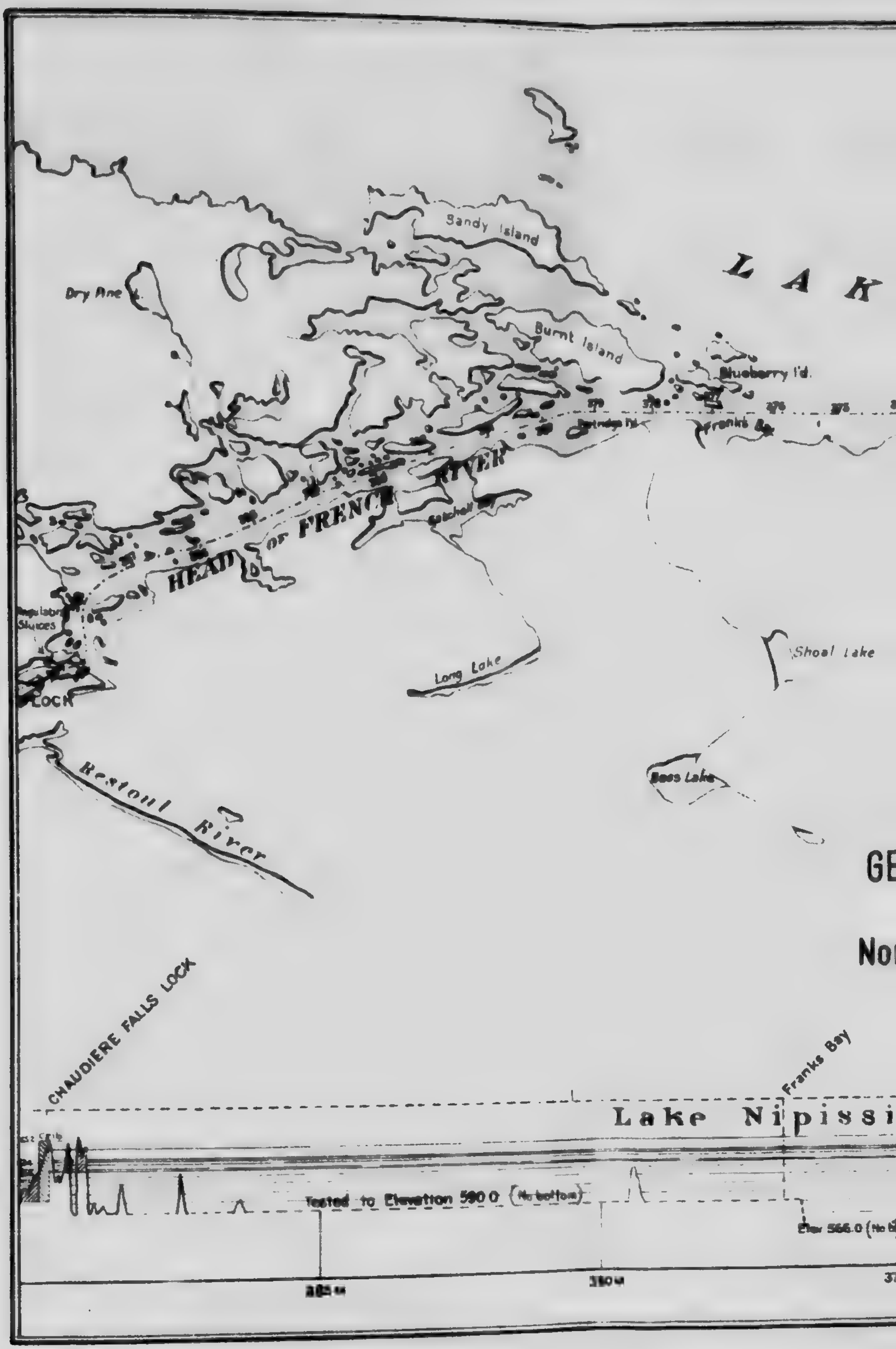
ESTIMATE PLAN

SAND BAY TO NORTH BAY

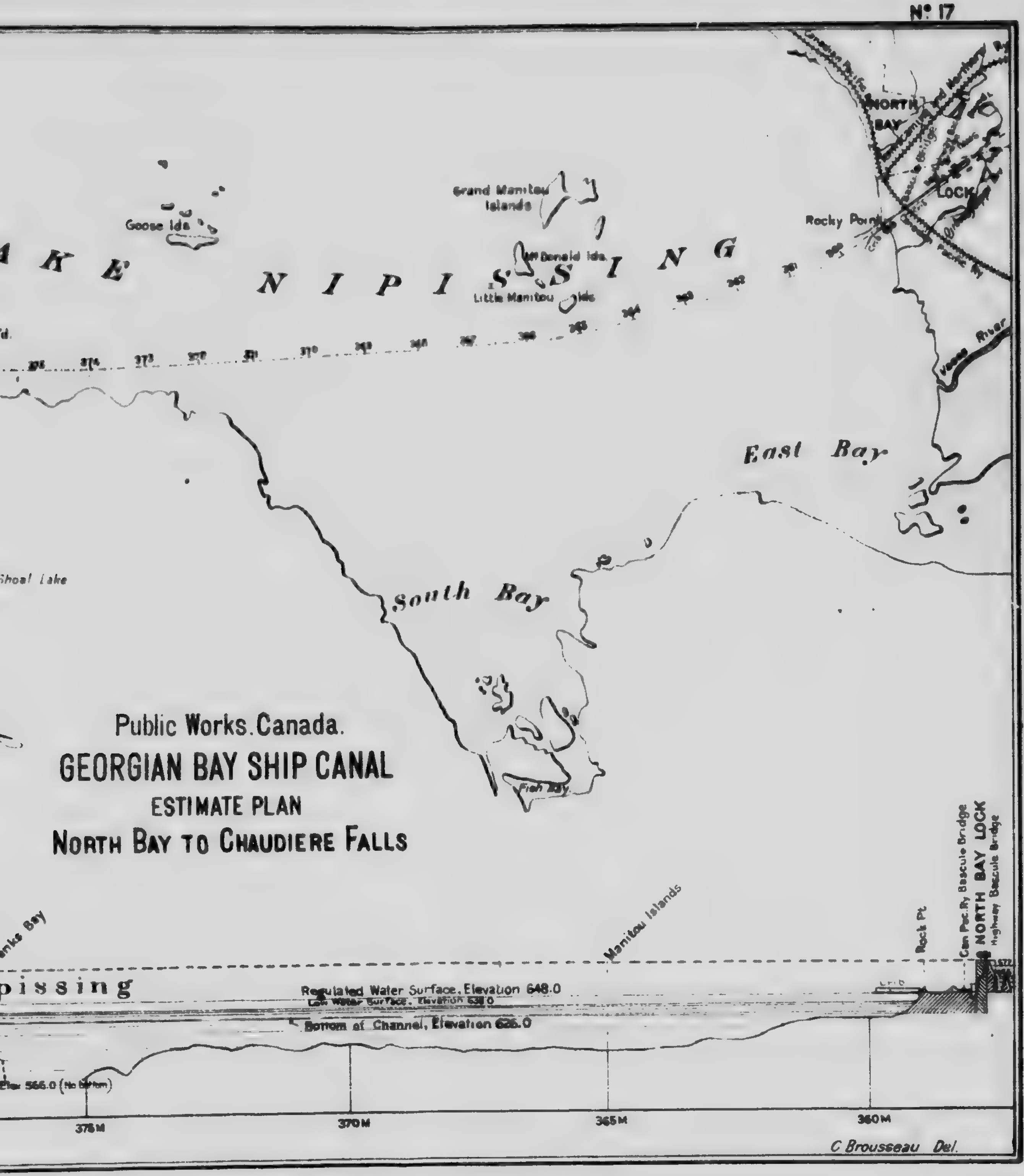
Nº 17



C Brousseau Del


Sandy Island
LAK
Dry Pine
Burnt Island
Blueberry I'd.
Franks Bay
HEAD OF FRENCH RIVER
Regulating Sluices
LOCK
Long Lake
Shoal Lake
Bass Lake
Restoul River
GE
No
CHAUDIERE FALLS LOCK
Franks Bay
Lake Nipissi
Tested to Elevation 590.0 (No bottom)
Elev 566.0 (No b
385 M
380 M

Nº 17



Public Works. Canada.

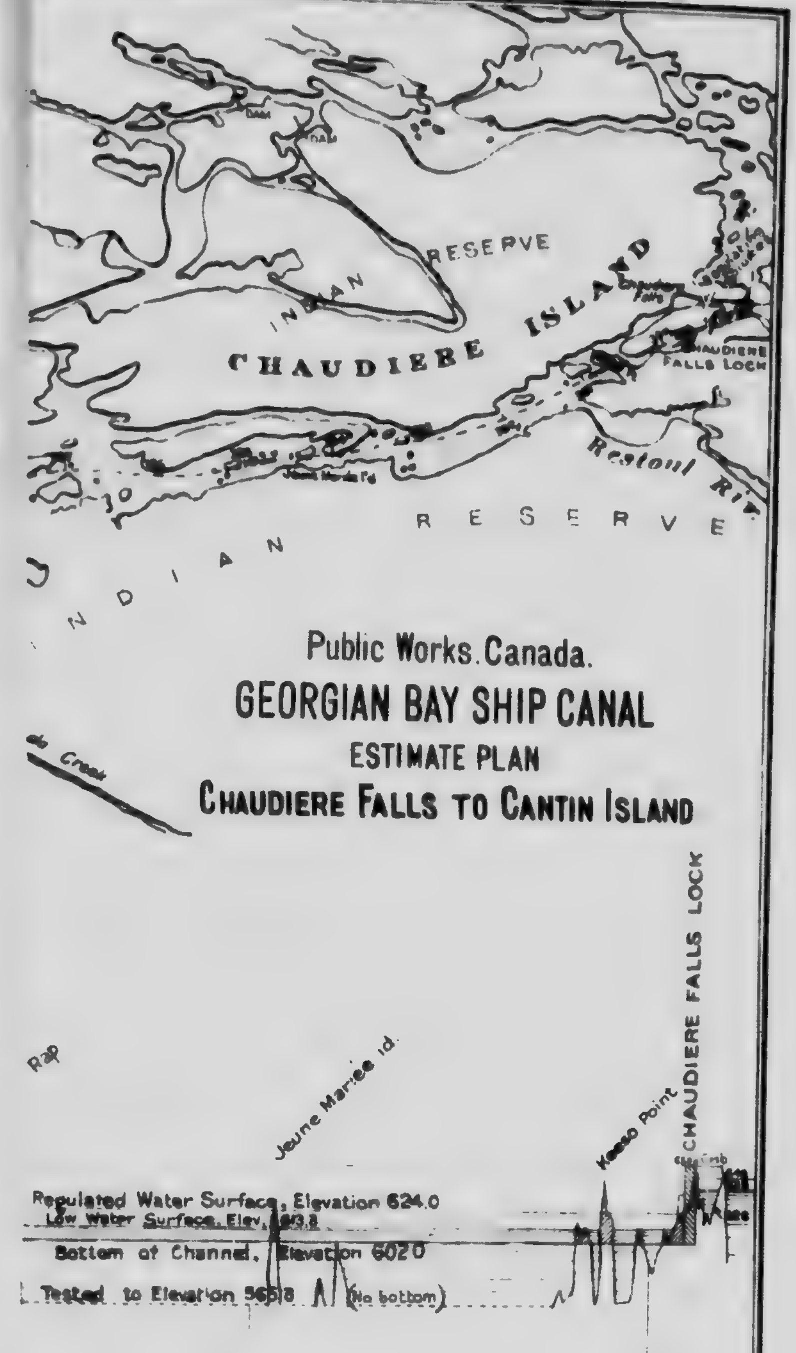
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

NORTH BAY TO CHAUDIERE FALLS

C Brousseau Del.

Nº 18



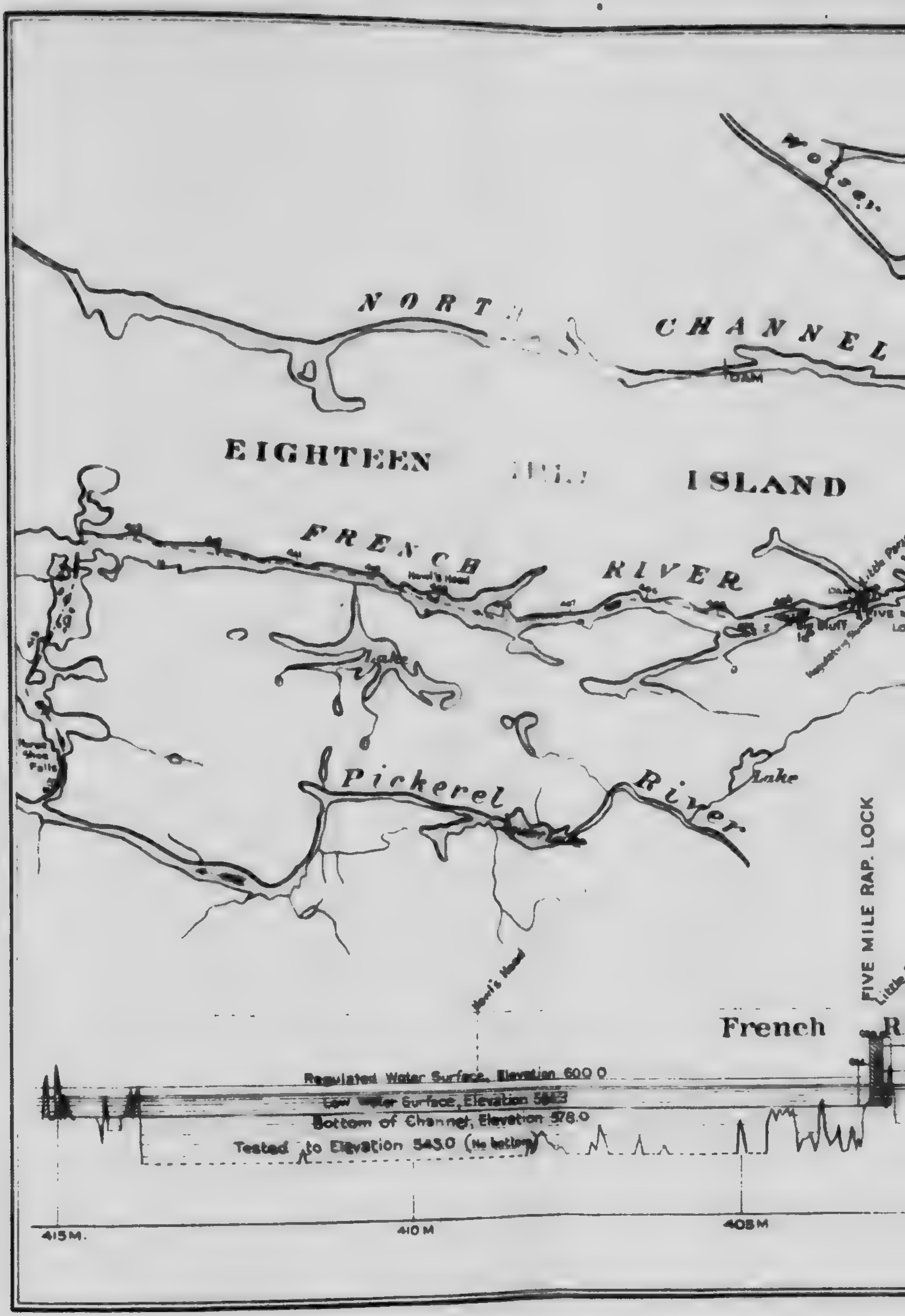
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

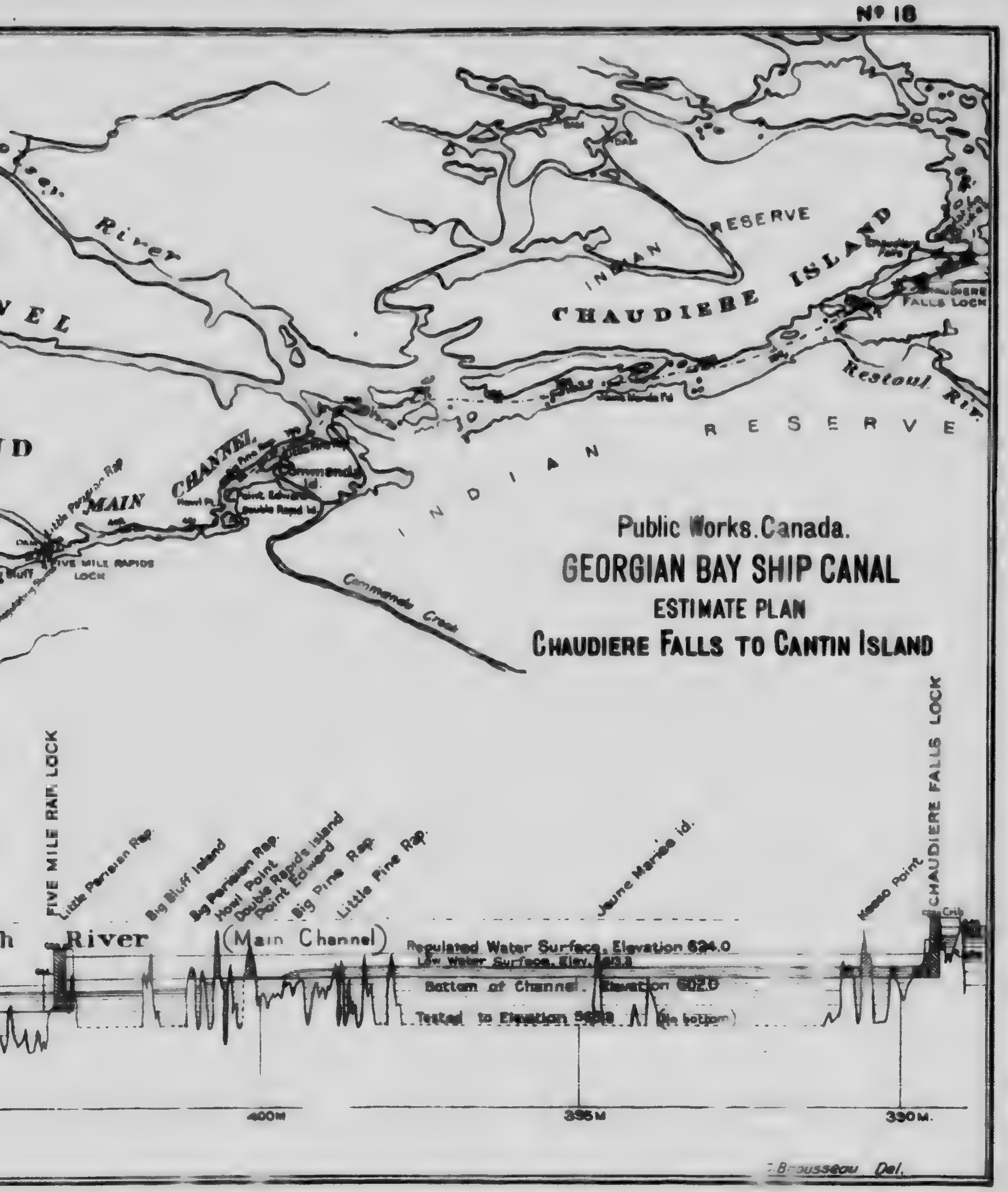
ESTIMATE PLAN

CHAUDIERE FALLS TO CANTIN ISLAND

C. Brousseau Del.


Wolsey
NORTH CHANNEL
DAM
EIGHTEEN MILE ISLAND
FRENCH RIVER
Lake
Pickerel River
Lake
Horse Shoe Falls
Big Bluff
FIVE MILE RAP. LOCK
French R
Regulated Water Surface, Elevation 600.0
Low Water Surface, Elevation
Bottom of Channel, Elevation 578.0
Tested to Elevation 545.0 (No bottom)
415 M.
410 M
405 M

Nº 18



Public Works. Canada.

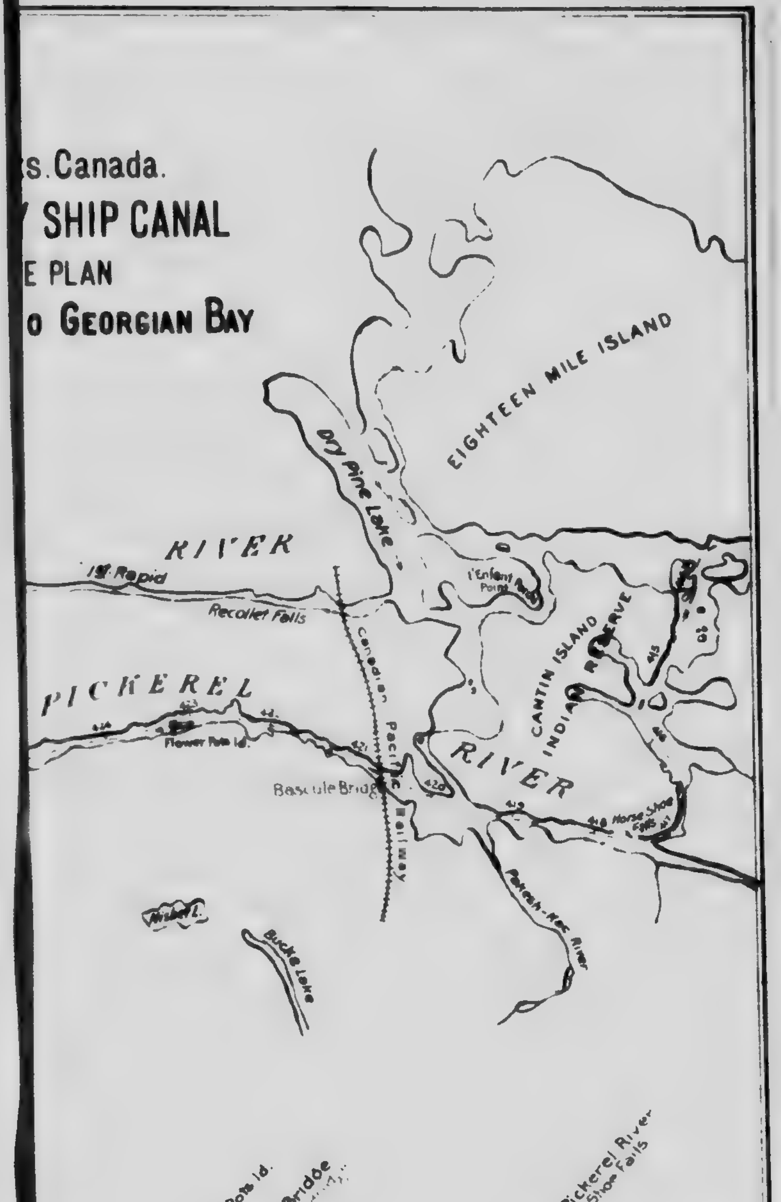
GEORGIAN BAY SHIP CANAL

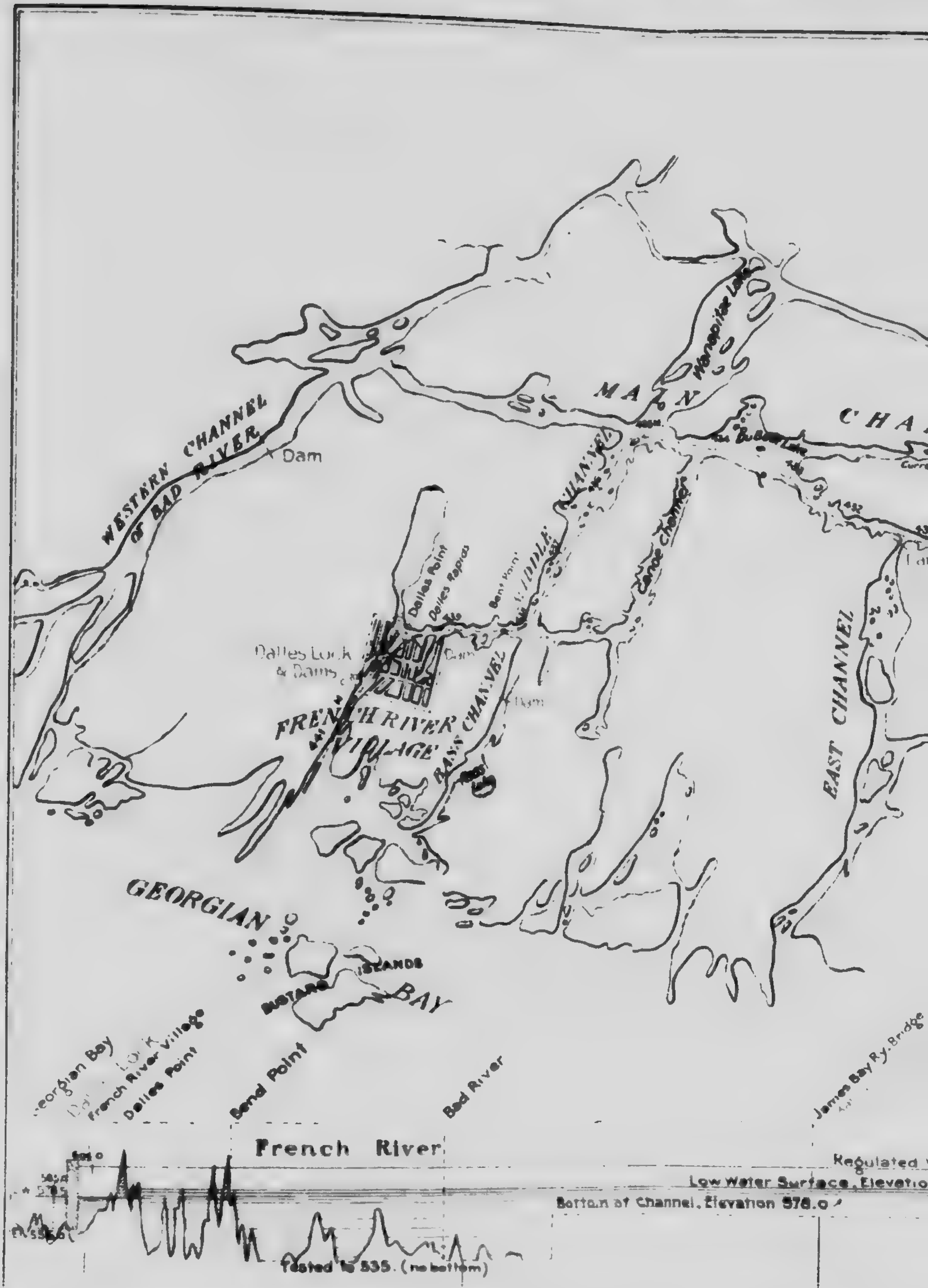
ESTIMATE PLAN

CHAUDIERE FALLS TO CANTIN ISLAND

C. Brousseau Del.

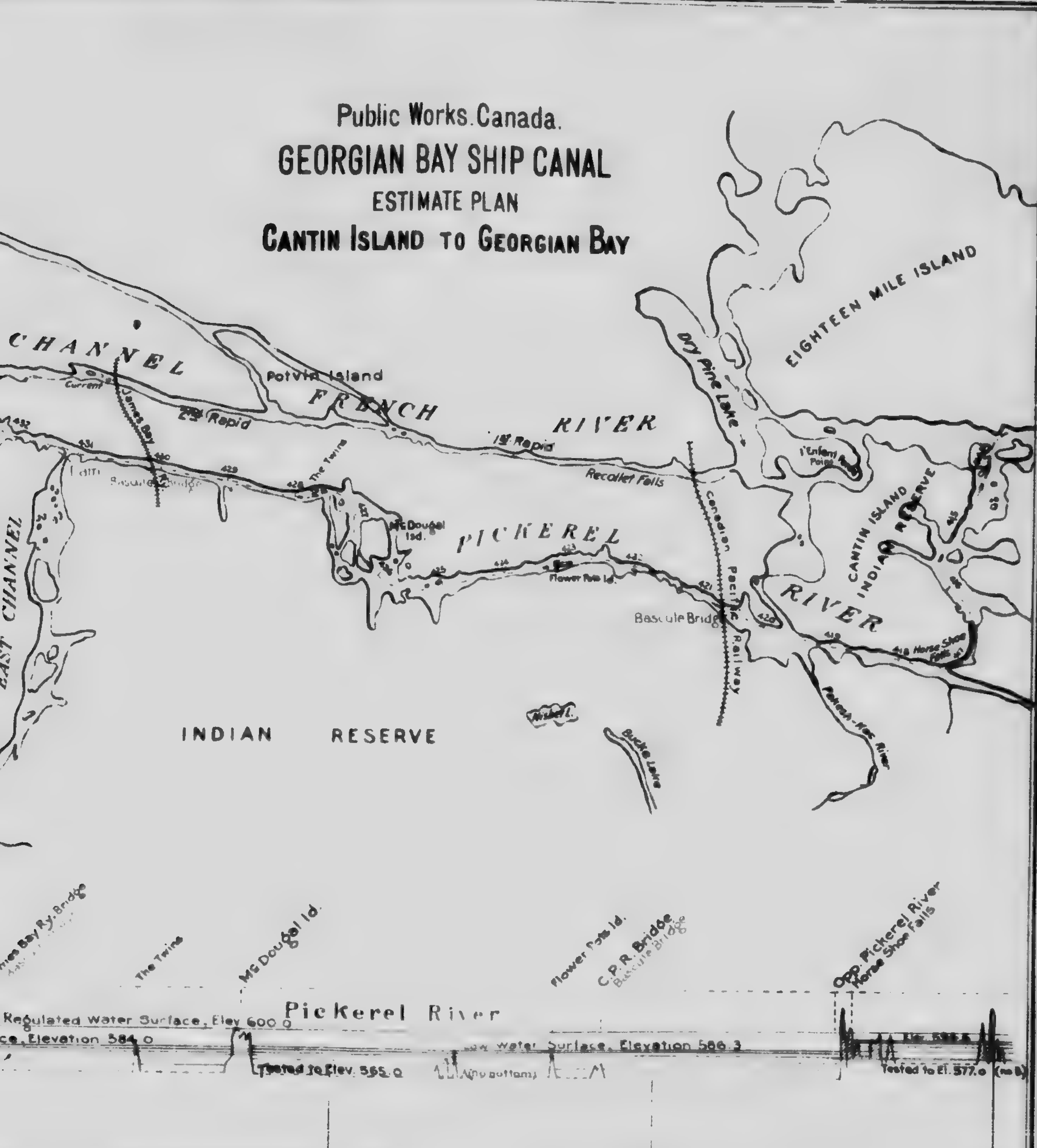
Nº 19


s. Canada.
Y SHIP CANAL
E PLAN
O GEORGIAN BAY
EIGHTEEN MILE ISLAND
Dry Pine Lake
RIVER
1st Rapid
Recollet Falls
l'Enfant Point
Canadian Pacific Rail Way
CANTIN ISLAND
INDIAN RESERVE
PICKEREL
Flower Pots Id.
Bascule Bridge
RIVER
Horse Shoe Falls
Pickerel River
Nisbet L.
Bucke Lake
Flower Pots Id.
C.P.R. Bridge
Opp. Pickerel River Horse Shoe Falls
iver
Low Water Surface, Elevation 586.3
Tested to El. 577.0
(no bottom)
420 M
415 M.
J.E.R. Matte, Del


WESTERN CHANNEL
OF BAD RIVER
Dam
MAIN
CHA
Wanapitei Lake
Dalles Point
Dalles Rapids
Bend Point
MIDDLE CHANNEL
Canoe Channel
Dalles Lock
& Dams
Dam
FRENCH RIVER
VILLAGE
BASS CHANNEL
Dam
EAST CHANNEL
GEORGIAN
ISLANDS
BUSTARD
BAY
Georgian Bay
Lock
French River Village
Dalles Point
Bend Point
Bad River
James Bay Ry. Bridge
French River
Regulated
Low Water Surface, Elevatio
Bottom of Channel, Elevation 578.0
Tested to 535. (no bottom)
440M
435M
430M

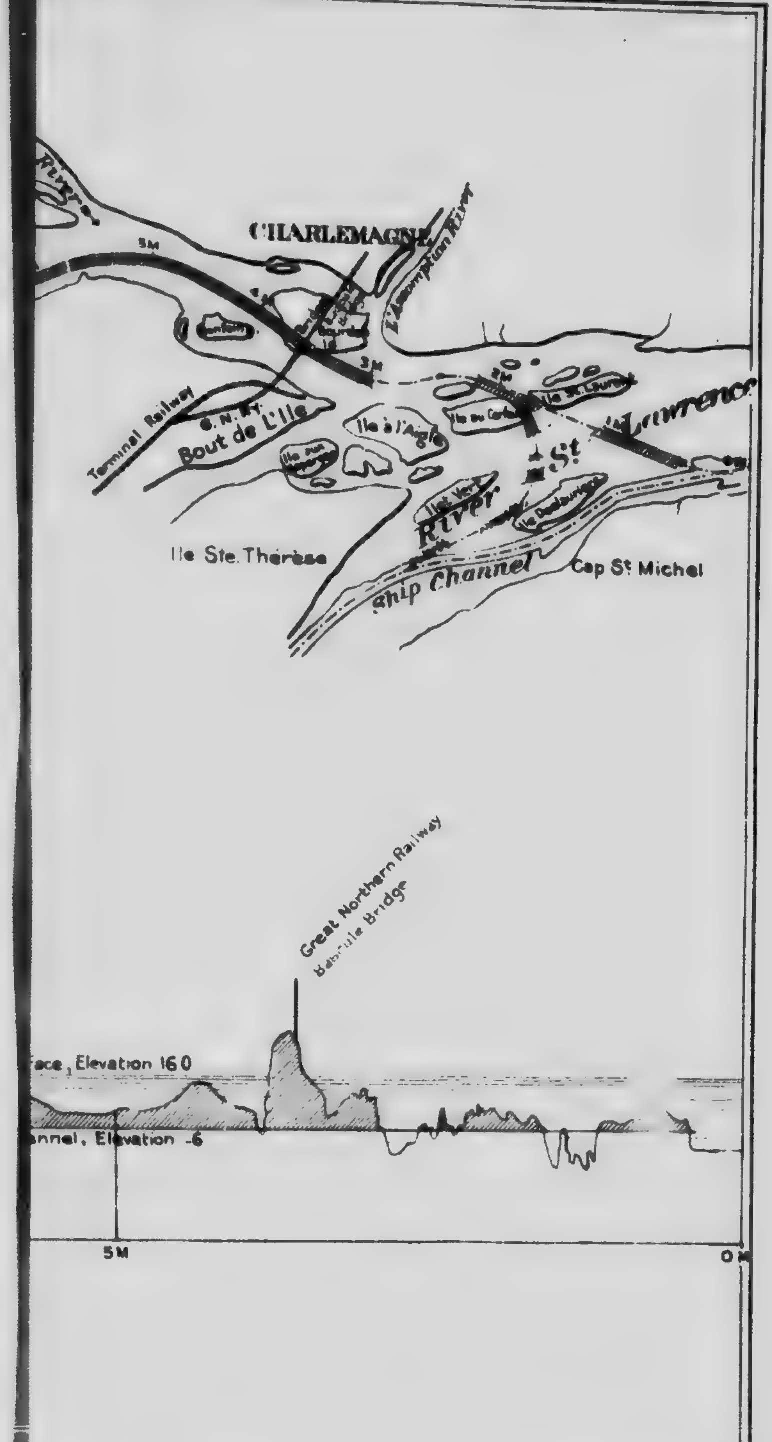
Nº 19

Public Works. Canada.
GEORGIAN BAY SHIP CANAL
ESTIMATE PLAN
CANTIN ISLAND TO GEORGIAN BAY

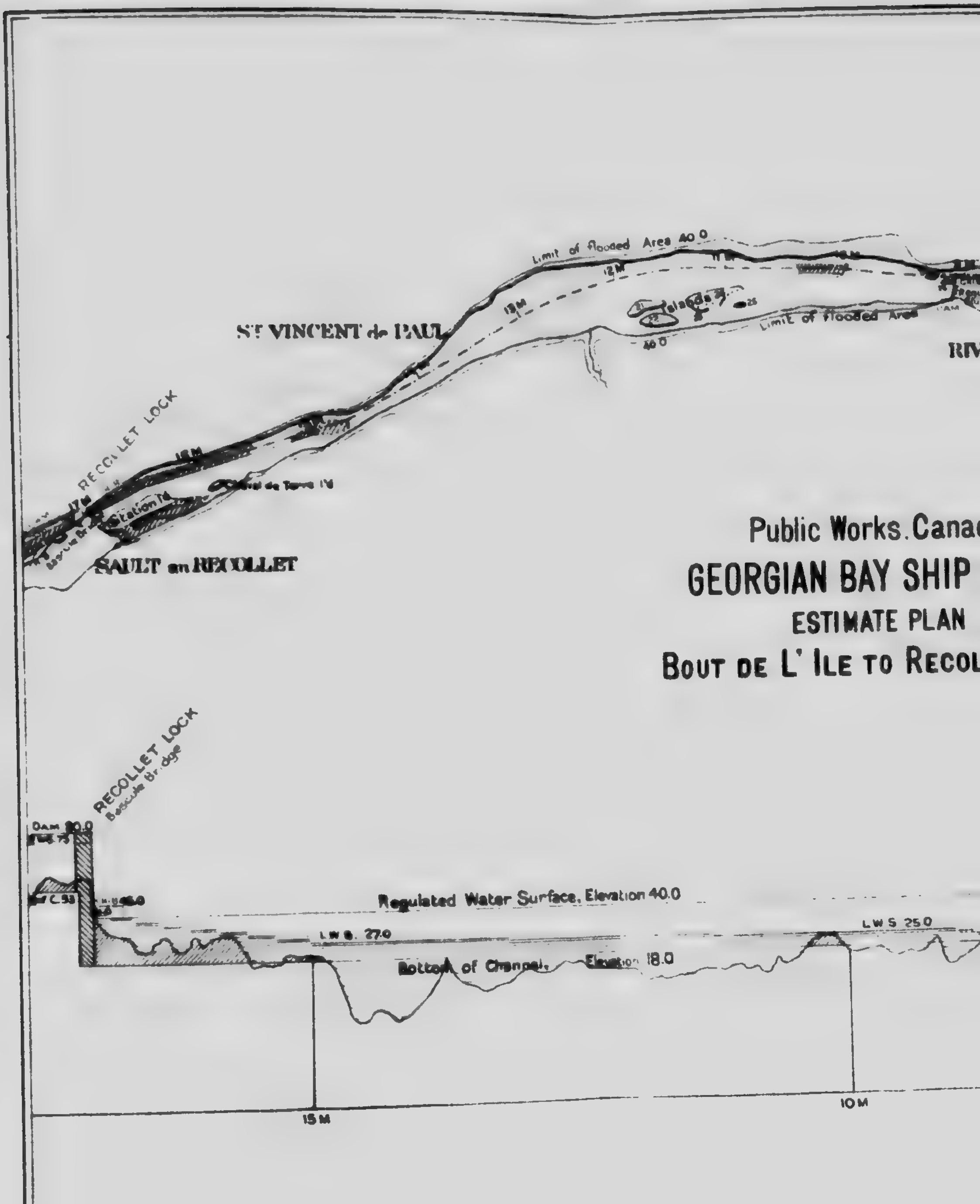


J.E.R. Motte, Del.

Nº 20



C Brousseau Del



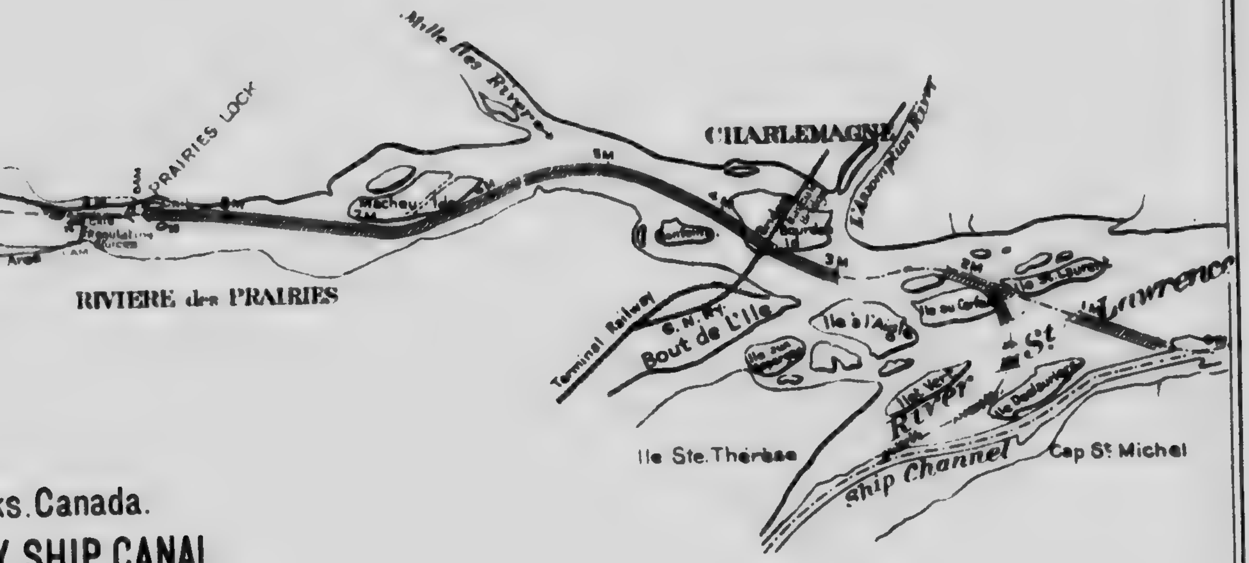
Public Works. Canad

GEORGIAN BAY SHIP

ESTIMATE PLAN

BOUT DE L' ILE TO RECOL

Nº 20

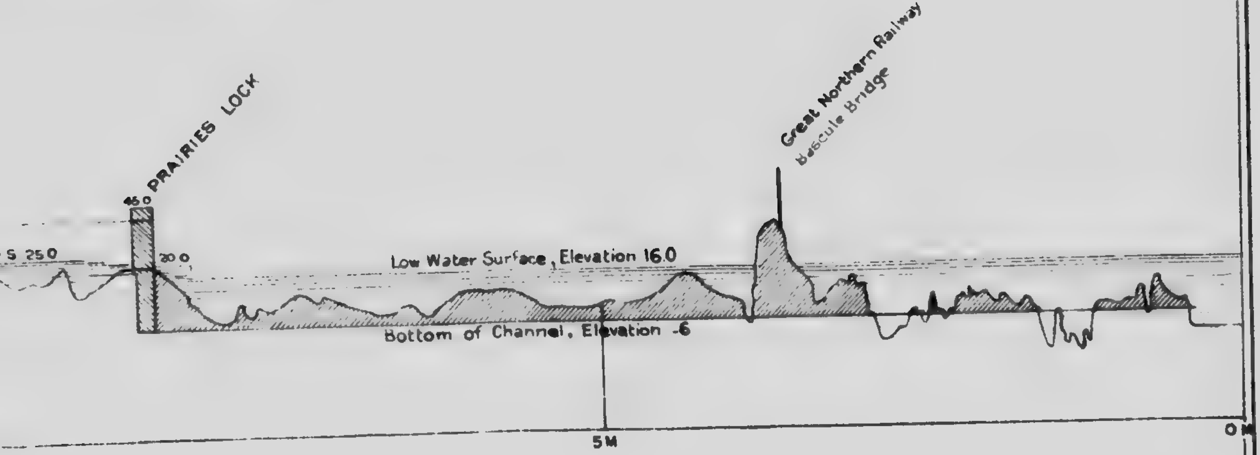


ks. Canada.

Y SHIP CANAL

TE PLAN

o RECOLLET LOCK



C Brousseau Del.

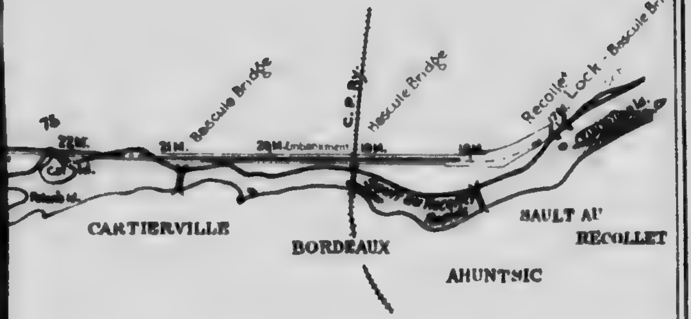
Public Works. Canada.

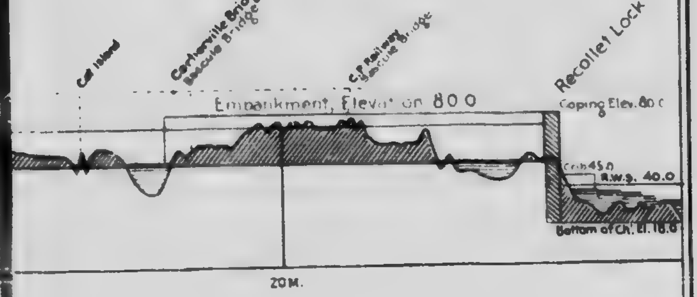
EORGIAN BAY SHIP CANAL

ESTIMATE PLAN

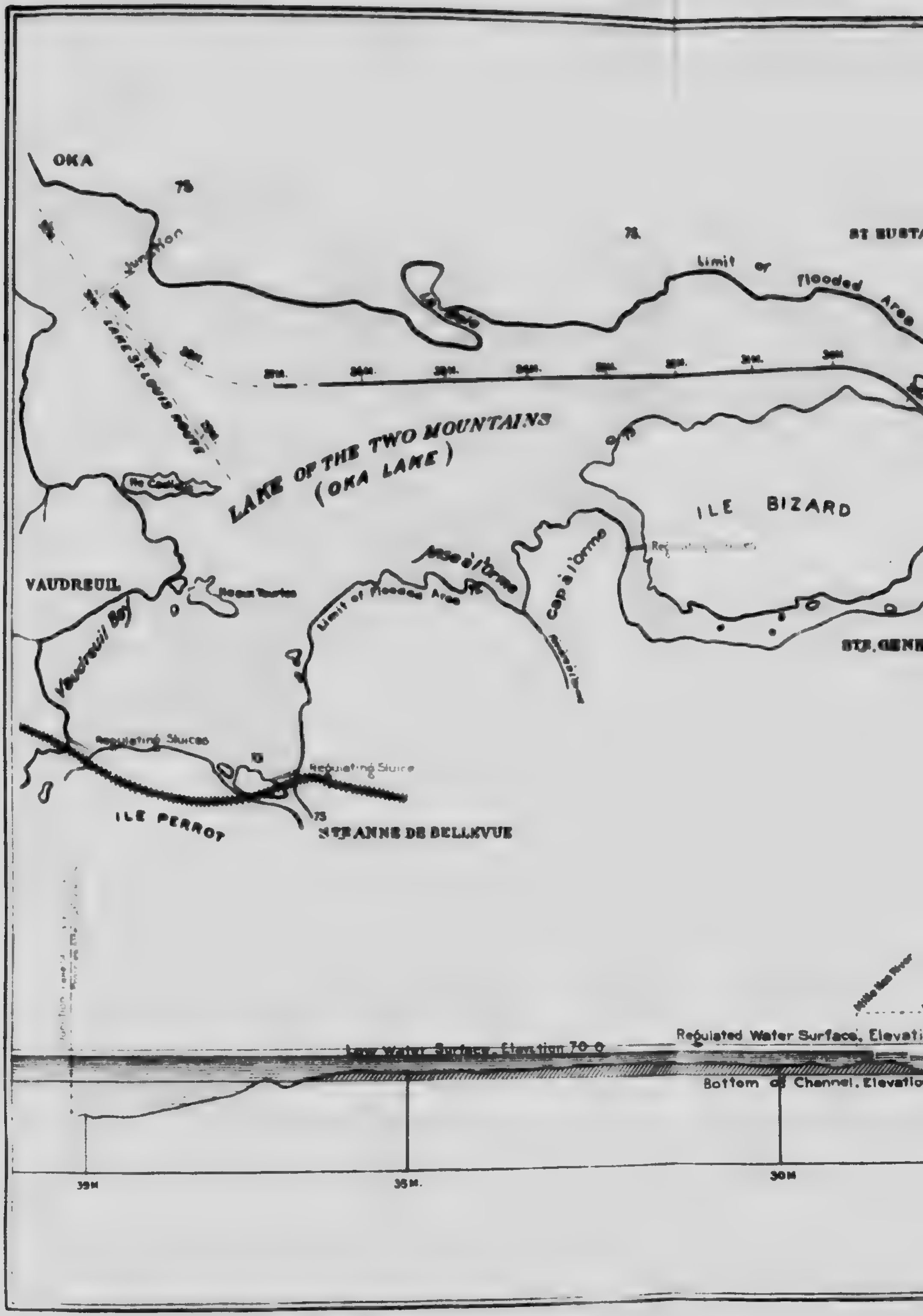
RECOLLET LOCK TO OKA

(RIVIÈRE DES PRAIRIES ROUTE.)

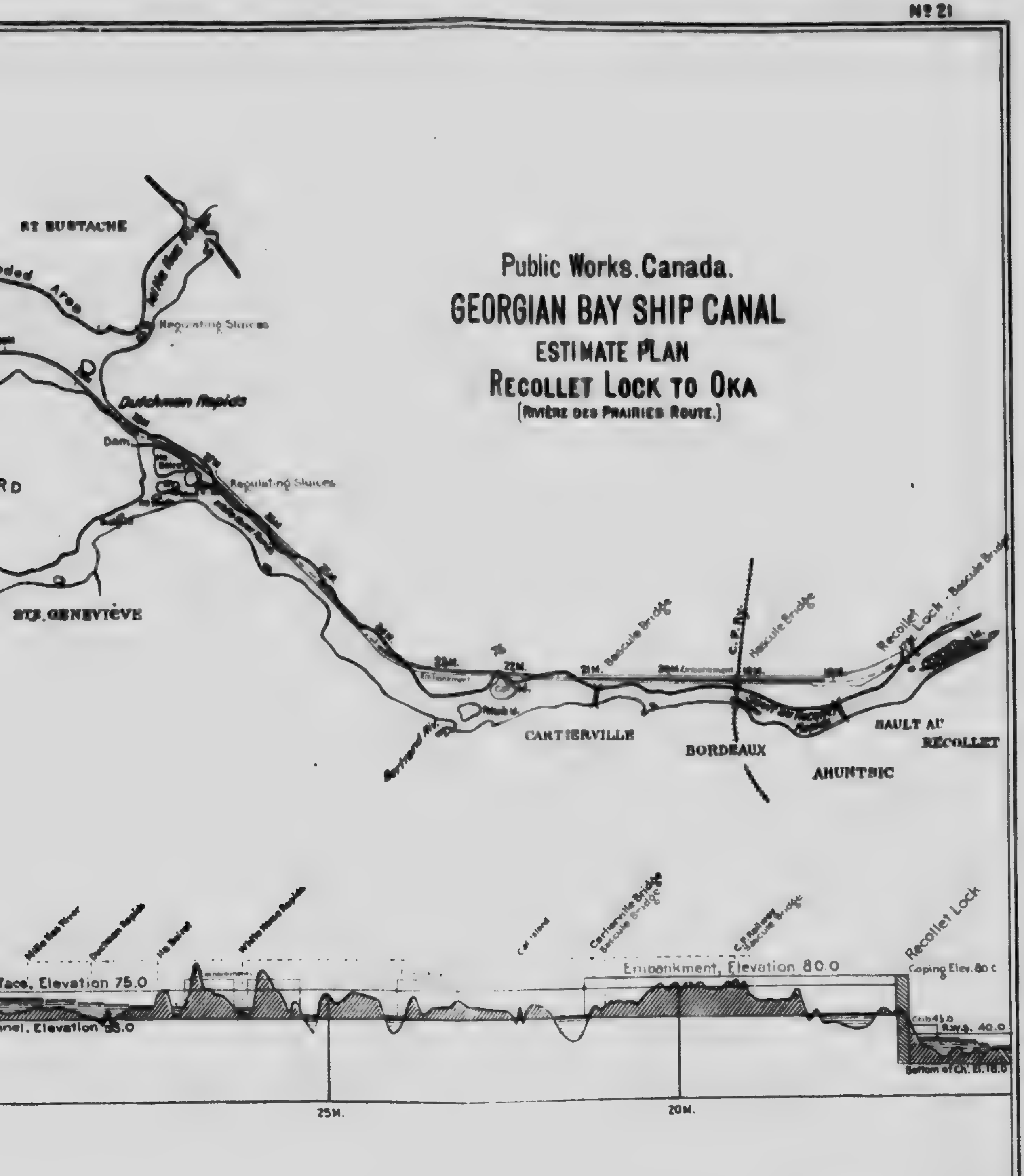




J.E.R. Matte, Del.


OKA
75
Junction
75
ST EUSTA
Limit of flooded Area
Lake St Louis Route
LAKE OF THE TWO MOUNTAINS
(OKA LAKE)
ILE BIZARD
Regulating Sluices
Anse à l'Orme
75
Cap à l'Orme
VAUDREUIL
Vaudreuil Bay
Limit of Flooded Area
STE GENE
Regulating Sluices
Regulating Sluice
75
ILE PERROT
STE ANNE DE BELLEVUE
Mille Iles River
Regulated Water Surface, Elevati
Low Water Surface, Elevation 70.0
Bottom of Channel, Elevatio
39M
35M
30M

Nº 21



Public Works. Canada.

GEORGIAN BAY SHIP CANAL

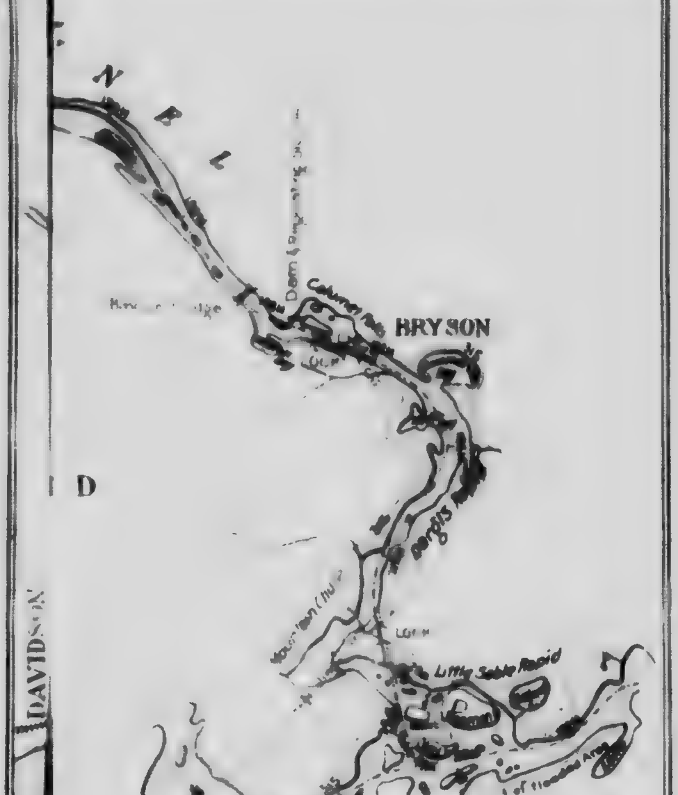
ESTIMATE PLAN

RECOLLET LOCK TO OKA

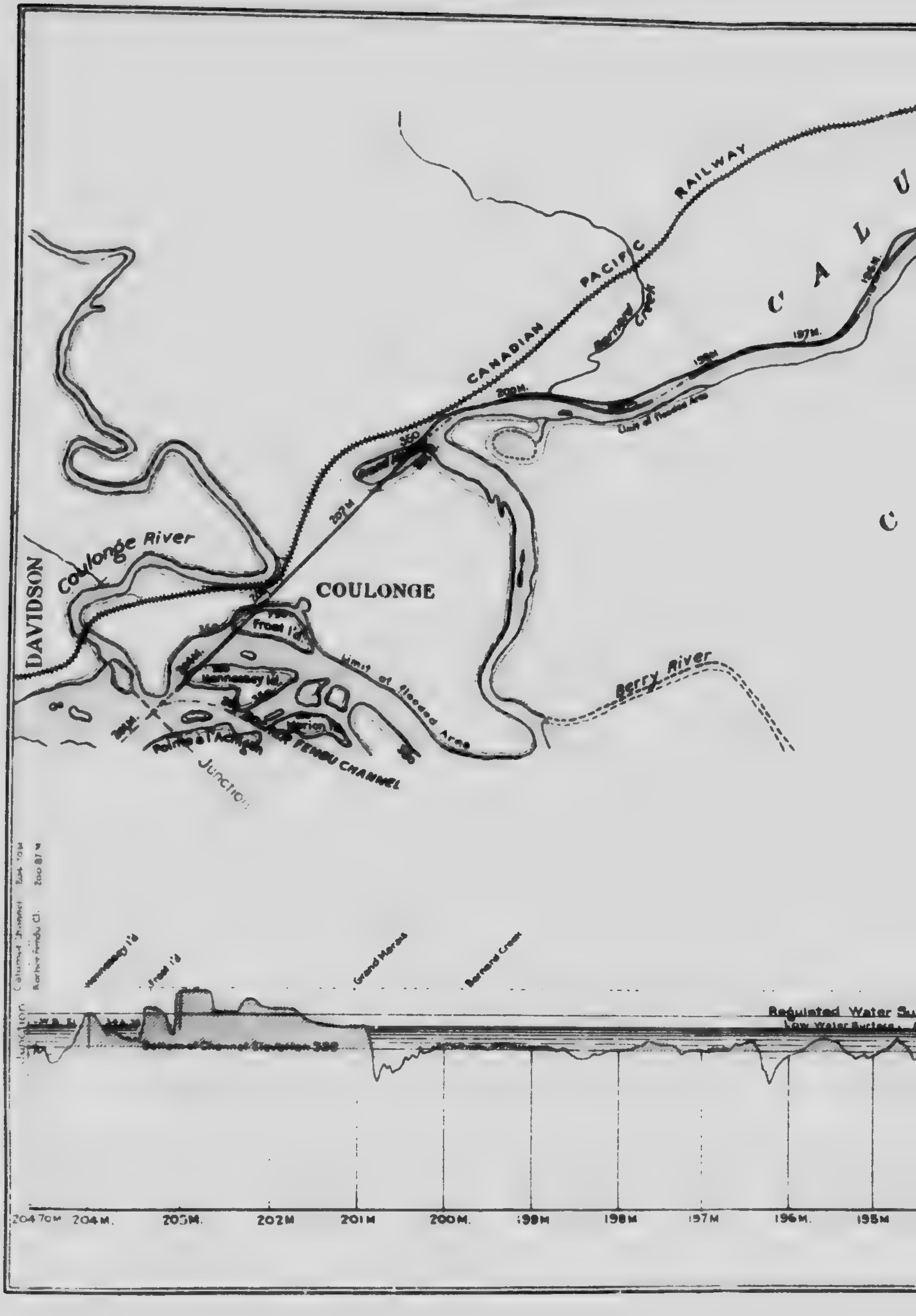
(RIVIÈRE DES PRAIRIES ROUTE.)

J. E. R. Matte, Del.

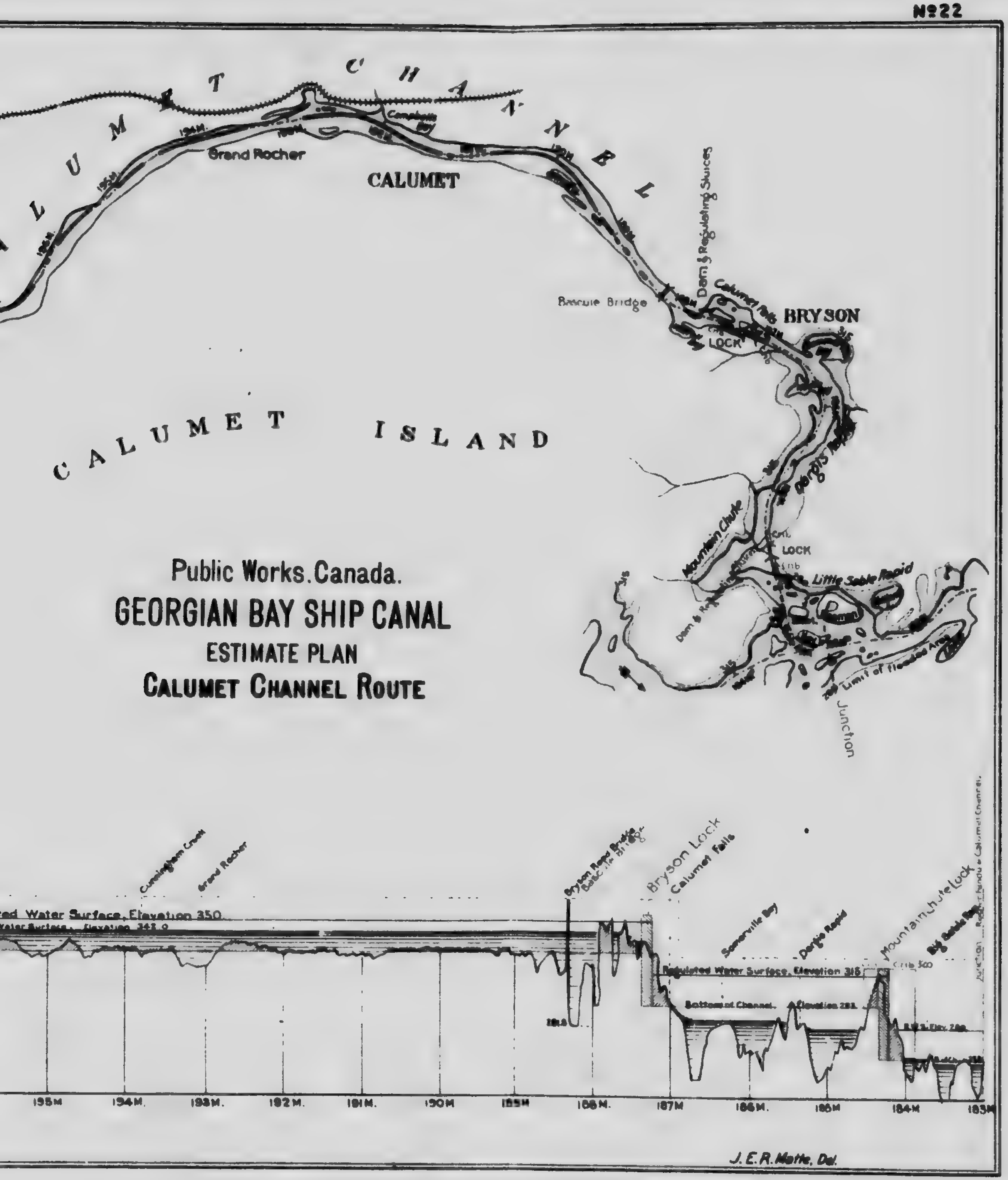
N822



J. E. R. Matte, Del.


CANADIAN PACIFIC RAILWAY
C A L U
C
Coulonge River
DAVIDSON
COULONGE
Frost I'd.
Hennessey I'd.
Pointe à l'Achigan
FENDU CHANNEL
Junction
Limit of flooded Area
Berry River
Bernard Creek
Grand Marais
207M
200M
198M
197M
350
Henneesey I'd
Frost I'd
Grand Marais
Bernard Creek
Junction
Bottom of Channel Elevation 338
Regulated Water Su
Low Water Surface
204.70M
204M.
203M.
202M
201M
200M.
199M
198M
197M
196M.
195M

Nº22



Public Works. Canada.

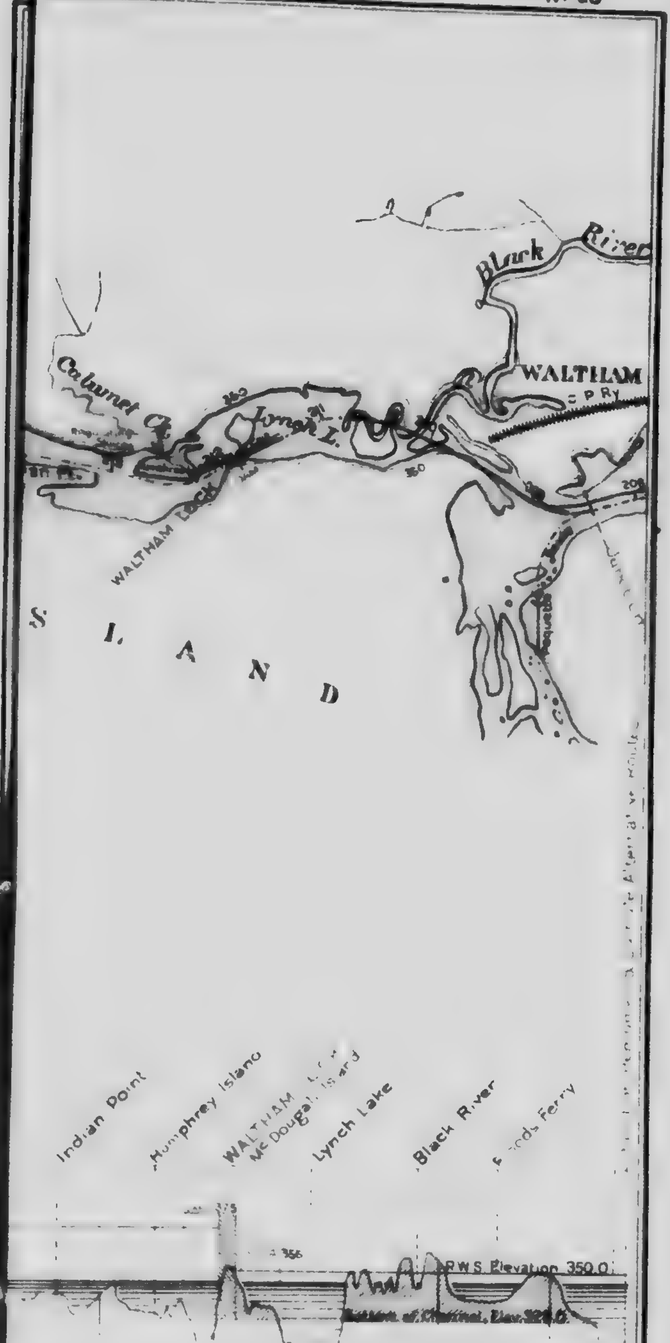
GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

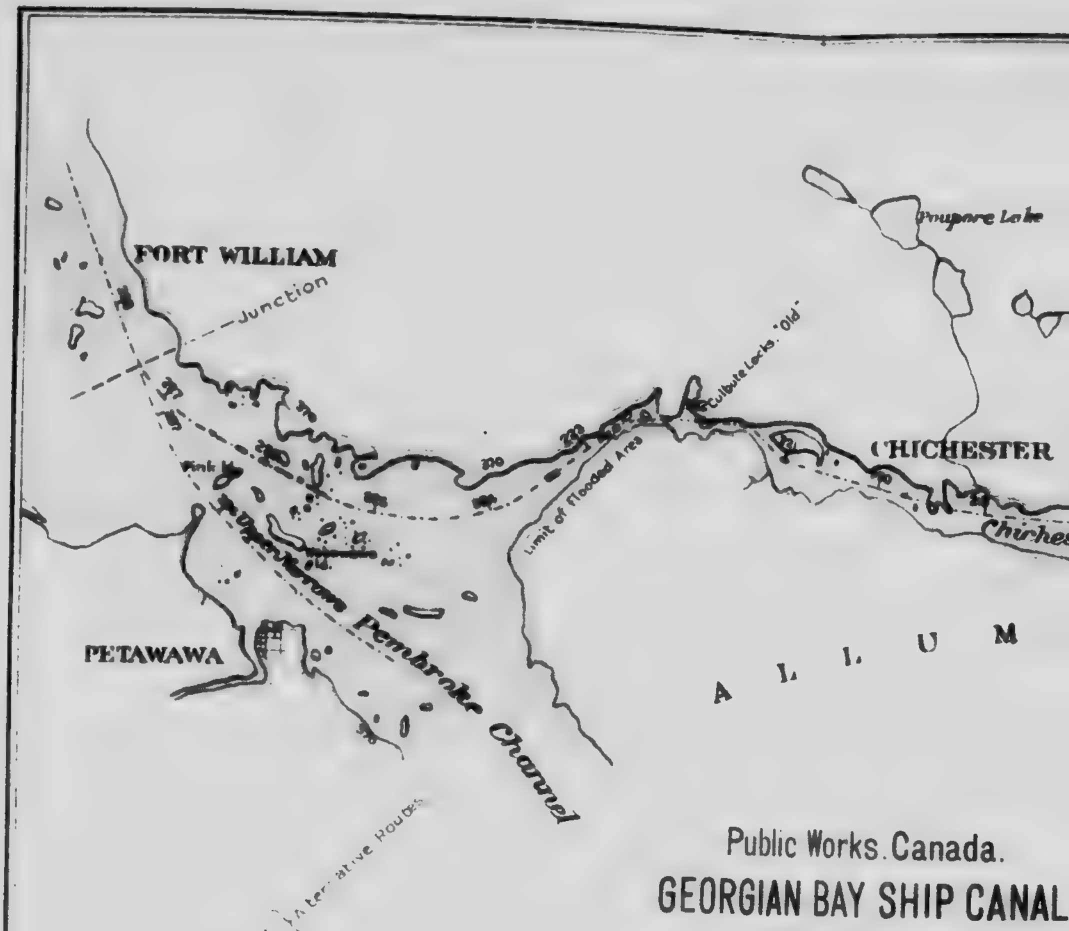
CALUMET CHANNEL ROUTE

J. E. R. Motte, Del.

Nº 23



C Brousseau De.



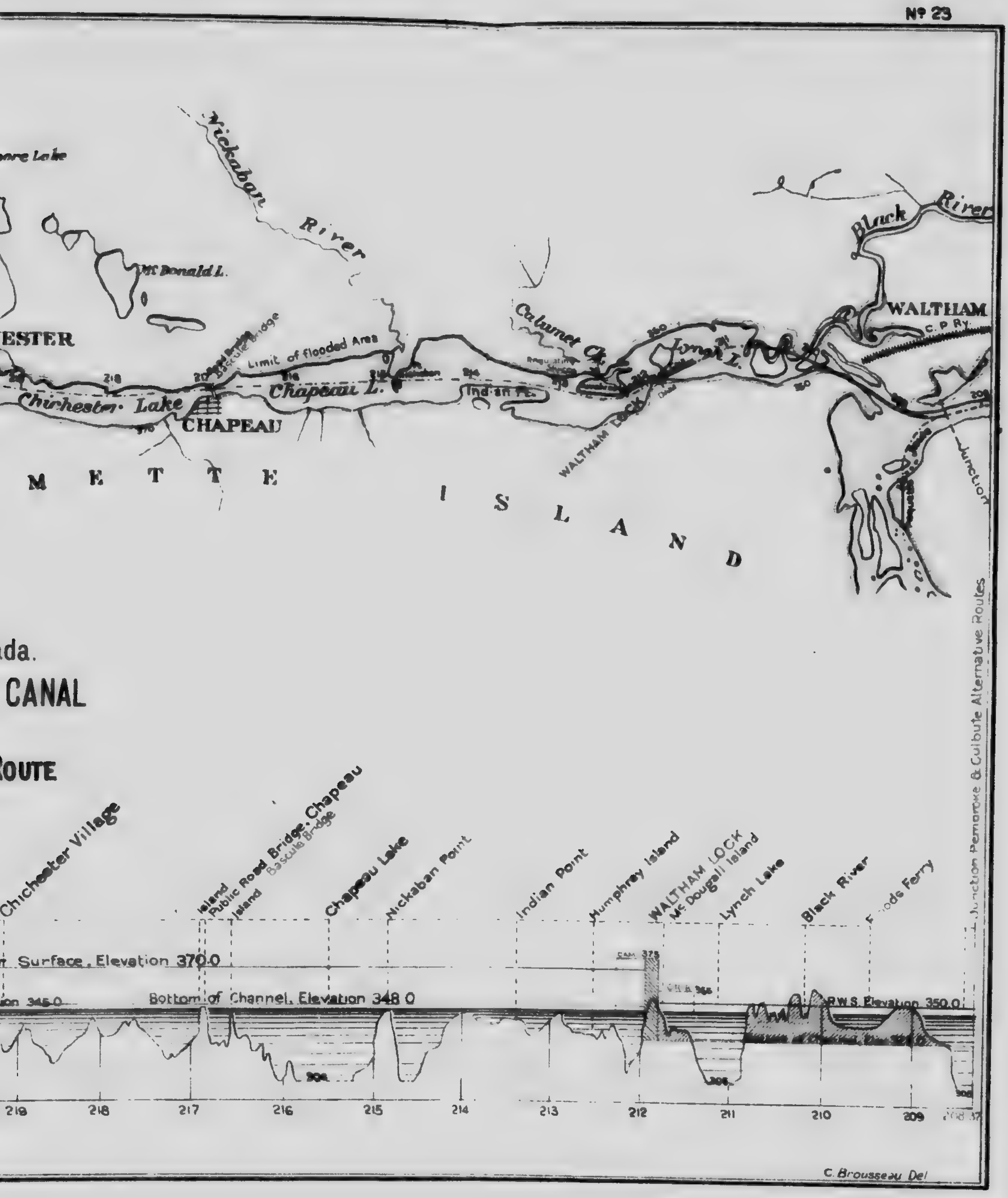
Public Works. Canada.

GEORGIAN BAY SHIP CANAL

ESTIMATE PLAN

CULBUTE CHANNEL ROUTE

Nº 23

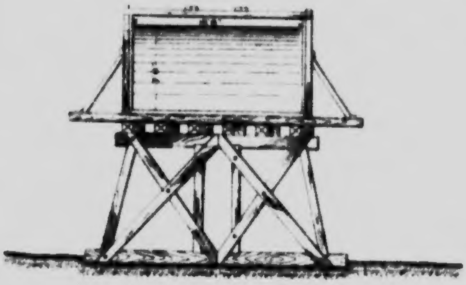


ada.

CANAL

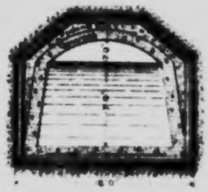
ROUTE

C. Brousseau Del



CROSS SECTION OF FLUME

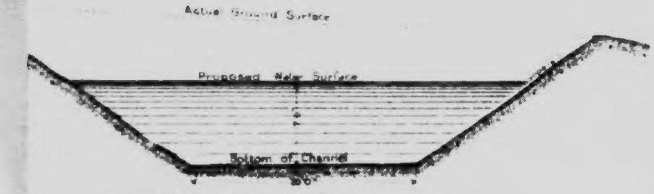
Feeder Canal



SECTION OF TUNNEL

Feeder Canal

Scale of Feet
0 2 4 6 8 10 12 14 16 18 20



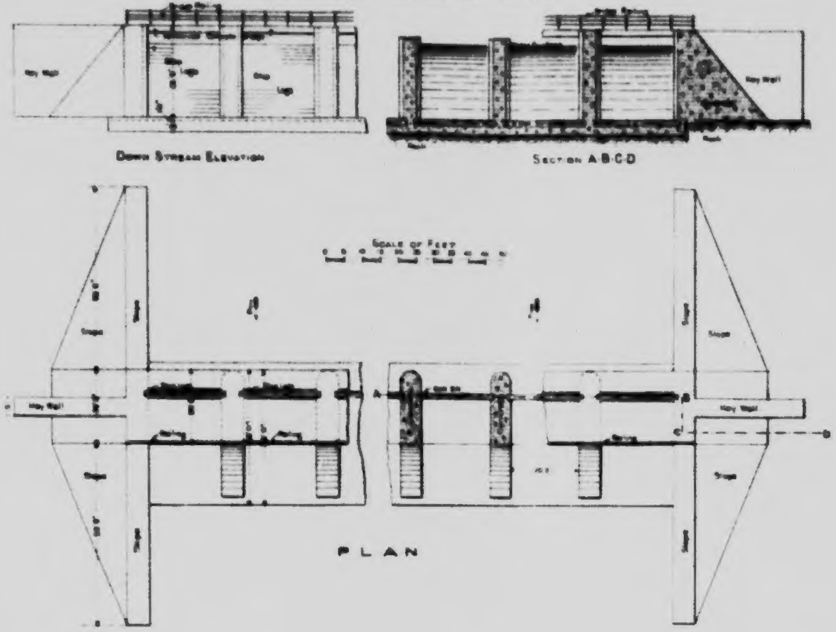
CROSS SECTION OF UNLINED OPEN CHANNEL.

Feeder Canal

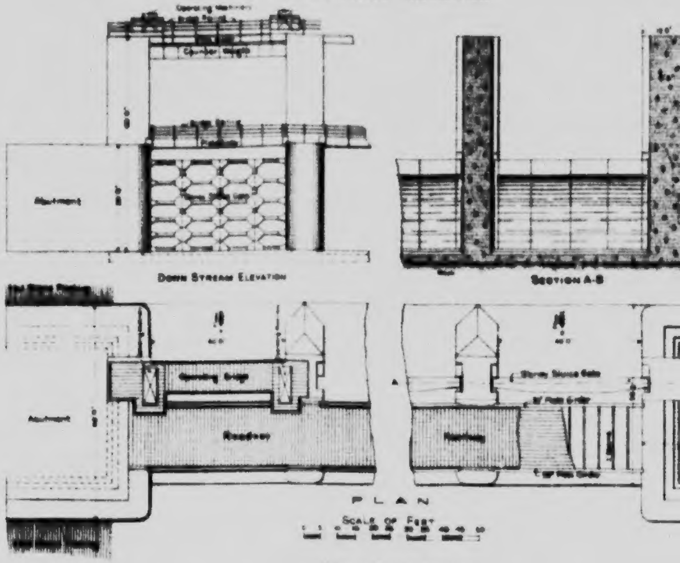
C Brousseau Del

STRUCTURE

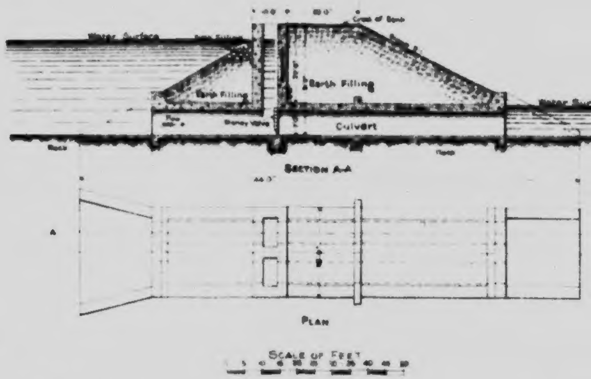
STOP LOG REGULATION SLUICES



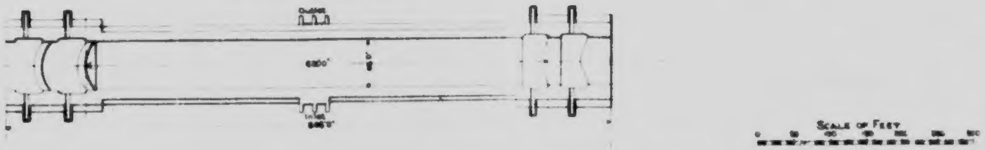
STONEY SLUICE REGULATION



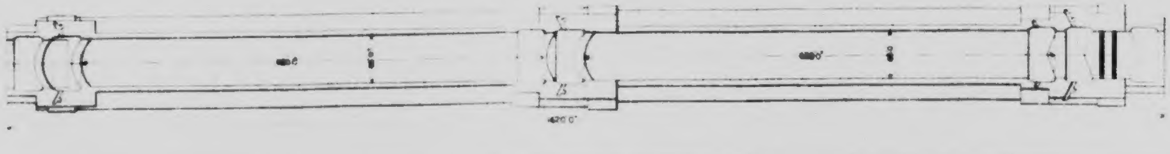
REGULATING CULVERT



STANDARD SINGLE LOCK

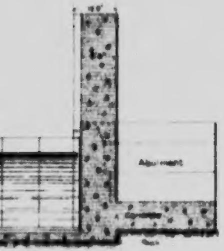


STANDARD FLIGHT OF TWO LOCKS

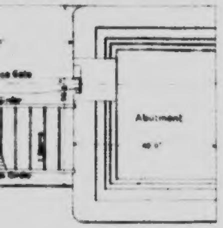


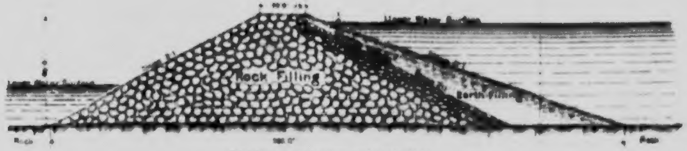
CTURES, ETC.

Nº24

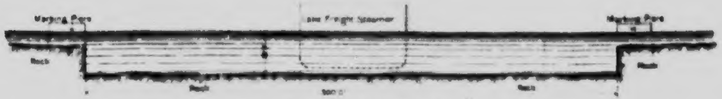


on A-B

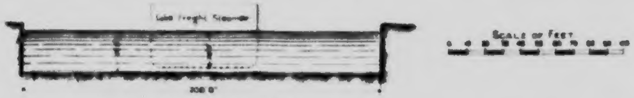




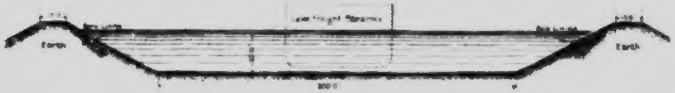
SECTION OF ROCK FILLED DAM



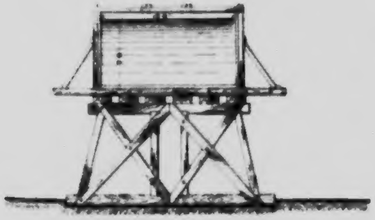
MINIMUM CHANNEL SECTION (Thro' Rock, wet)



MINIMUM CANAL SECTION (Thro Rock, dry)

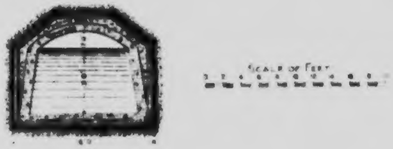


MINIMUM CANAL SECTION (Thro Earth, dry)



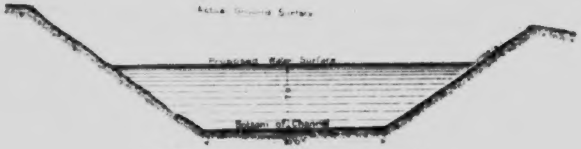
CROSS SECTION OF FLUME

Feeder Canal



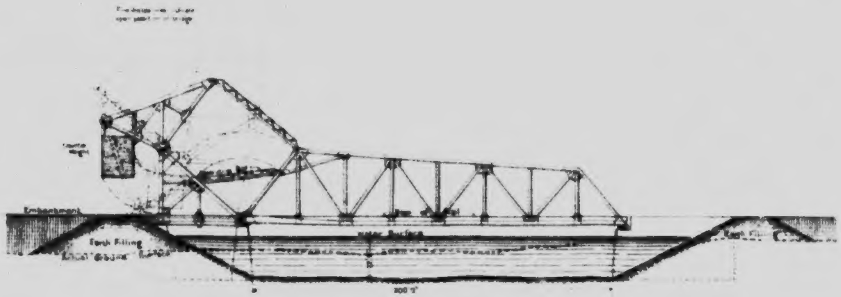
SECTION OF TUNNEL

Feeder Canal



CROSS SECTION OF UNLINED OPEN CHANNEL

Feeder Canal



BASCULE BRIDGE

SCALE OF FEET
0 10 20 30 40 50 60 70 80 90 100

C. Brousseau Del.